MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE

MADANAPALLE

(UGC-AUTONOMOUS)

www.mits.ac.in

DEPARTMENT OF COMPUTER SCIENCE & TECHNOLOGY

Course Structure
And
Detailed Syllabus

For the students admitted to

B. Tech. Regular Four Year Degree Programme from the academic year 2018-19

and

B. Tech. Lateral Entry Scheme from the academic year 2019-20

B.TECH. COMPUTER SCIENCE & TECHNOLOGY

Vision and Mission of the Department

Vision of the Department	To bring forth globally competent engineers with societal consciousness, who thrive in academics and research in Computer Science and technology.
Mission of the Department	**M1**: To deliver technical education of the highest quality by improving the curriculum and using effective pedagogical techniques by qualified faculty. **M2**: To foster interaction between Industry and academia, to improve students' abilities in research, innovation, and entrepreneurship. **M3**: To prepare the students to become professionally competent and intellectually adept by imparting required Skills to mitigate the societal problems.

Programme Educational objectives (PEOs)

PEO1: Graduates will have successful career by contributing for innovation of new technologies and systems in the key domains of Computer Science and Technology.
PEO2: Graduates will be able to perform technical/ administrative roles in information technology industry / R&D sectors and pursue higher education in reputed institutions.
PEO3: Graduates will be ethically and socially responsible towards the societal development and opting a career as an entrepreneur with moral values in various domains of Computer Science & Technology

Program Specific Outcomes (PSOs)

PSO1: Ability to design algorithms using mathematical models and implement problems through different programming tools to solve real world problems.
PSO2: Ability to apply Software Engineering Principles & Practices in the domain of Database Management Systems, Compilers, Computer Networks, Operating Systems and allied areas, Mobile and web based applications under realistic constraints
PSO3: Ability to implement the principles and techniques of Artificial Intelligence and Machine Learning, IoT and Cloud Computing, Data Analytics & Security by applying them to develop intelligent systems and data-driven solutions.

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

B. Tech Four Year Curriculum Structure

Branch: COMPUTER SCIENCE & TECHNOLOGY

Total Credits: 160 (4 Year Course)

I. Induction Program and Holistic Development Activities

Sl.No	Title	Duration
1	Induction Program (Mandatory)	Three weeks duration at the start of First Year (Refer Annexure - I)
2	Holistic Development Activities (Every Student from Semester 2 – 8 should register for at least one activity)	Three hours per week (Activity list is enclosed in Annexure - I)
3	Virtual Laboratory (Students are encouraged to choose and register for any of the Virtual laboratories he /she is interested)	As specified by the Virtual Laboratory

II. Semester-wise Structure of Curriculum

(L = Lecture, T = Tutorial, P = Practical, C = Credit)

Dept. of Computer Science & Technology

I Year I Semester

Sl. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
1	Humanities, Social Sciences including Management	18ENG101	Professional English	2	0	2	4	3
2	Basic Science Course	18MAT101	Engineering Calculus	3	1	0	4	4
3	Basic Science Course	18CHE101	Engineering Chemistry	3	0	0	3	3
4	Engineering Science Course	18ME101	Engineering Graphics	2	0	3	5	3.5
5	Engineering Science Course	18CSE101	Programming for Problem Solving (Python)	2	0	2	4	3
6	Basic Science Course	18CHE201	Chemistry Laboratory	0	0	3	3	1.5
7	Engineering Science Course	18CSE202	Engineering and IT Workshop	0	0	3	3	1.5
			Total	**12**	**1**	**13**	**26**	**19.5**

Dept. of Computer Science & Technology

I Year II Semester

Sl. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
1	Basic Science Course	18MAT110	Linear Algebra	3	1	0	4	4
2	Basic Science Course	18PHY102	Modern Physics	3	1	0	4	4
3	Engineering Science Course	18EEE101	Basic Electrical Engineering	3	0	0	3	3
4	Engineering Science Course	18CSE102	C Programming and Data Structures	3	0	0	3	3
5	Basic Science Course	18PHY201	Physics Laboratory	0	0	3	3	1.5
6	Engineering Science Course	18EEE201	Electrical Engineering Laboratory	0	0	3	3	1.5
7	Engineering Science Course	18CSE201	C Programming and Data Structures Laboratory	0	0	3	3	1.5
			Total	**12**	**2**	**9**	**23**	**18.5**

Dept. of Computer Science & Technology

II Year I Semester

Sl. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
1	Humanities, Social Sciences including Management	18HUM102	Principles of Management	3	0	0	3	3
2	Basic Science Course	18MAT111	Probability Models And Statistics	3	1	0	4	4
3	Professional Core Course	18CST101	Data Structures	3	0	0	3	3
4	Professional Core Course	18CST102	Object Oriented Programming using JAVA	3	0	0	3	3
5	Professional Core Course	18CST103	Database Management Systems	3	0	0	3	3
6	Professional Core Course	18CST201	Data Structures Laboratory	0	0	3	3	1.5
7	Professional Core Course	18CST202	Object Oriented Programming using JAVA Laboratory	0	0	3	3	1.5
8	Professional Core Course	18CST203	Database Management Systems	0	0	3	3	1.5
9	Mandatory non-credit Course		Mandatory Course – I (Refer Annexure - V)	2	0	0	2	0
			Total	**17**	**1**	**9**	**27**	**20.5**

Dept. of Computer Science & Technology

II Year II Semester

Sl. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
1	Humanities, Social Sciences including Management	18HUM101	Economics and Financial Accounting for Engineers	3	0	0	3	3
2	Basic Science Course	18MAT112	Discrete Mathematical Structures	3	0	0	3	3
3	Basic Science Course	18BIO101	Life Sciences for Engineers	3	0	0	3	3
4	Professional Core Course	18CST104	Digital Logic Design	2	1	0	3	3
5	Professional Core Course	18CST105	Design and Analysis of Algorithms	2	1	0	3	3
6	Professional Core Course	18CST106	Operating Systems	3	0	0	3	3
7	Humanities, Social Sciences including Management	18ENG201	English Communication – Listening & Speaking Laboratory	0	0	3	3	1.5
8	Professional Core Course	18CST204	Design and Analysis of Algorithms Laboratory	0	0	3	3	1.5
9	Professional Core Course	18CST205	Operating Systems Laboratory	0	0	3	3	1.5
10	Mandatory non-credit Course		Mandatory Course – II (Refer Annexure - V)	2	0	0	2	0
			Total	**18**	**2**	**9**	**29**	**22.5**
Summer Internship								

Dept. of Computer Science & Technology

III Year I Semester

Sl. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
1	Professional Core Course	18CST107	Computer Organization and Architecture	3	0	0	3	3
2	Professional Core Course	18CST108	Computer Networks	3	0	0	3	3
3	Professional Core Course	18CST109	Formal Language Automata and Compiler Design	2	1	0	3	3
4	Professional Core Course	18CST110	AI Tools, Techniques and Applications	3	0	0	3	3
5	Professional Elective Course		Discipline Elective - I (Refer Annexure - III)	3	0	0	3	3
6	Open Elective Course		Open Elective – I (Refer Annexure - II)	3	0	0	3	3
7	Humanities, Social Sciences including Management	18ENG202	Corporate Communication Laboratory	0	0	2	2	1
8	Professional Core Course	18CST206	Computer Networks Laboratory	0	0	3	3	1.5
9	Professional Core Course	18CST207	AI Tools, Techniques and Applications Laboratory	0	0	3	3	1.5
10	Mandatory non-credit Course		Mandatory Course – III (Refer Annexure - V)	2	0	0	2	0
			Total	**19**	**1**	**8**	**28**	**22**

Dept. of Computer Science & Technology

III Year II Semester

Sl. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
1	Humanities, Social Sciences including Management	18ENG102	English Communication - Reading and Writing	2	0	0	2	2
2	Engineering Science Course	18CST111	Internet of Things	3	0	0	3	3
3	Professional Core Course	18CST112	Software Engineering	3	0	0	3	3
4	Professional Elective Course		Discipline Elective – II (Refer Annexure - III)	3	0	0	3	3
5	Professional Elective Course		Discipline Elective– III (Refer Annexure - III)	3	0	0	3	3
6	Open Elective Course		Open Elective – II (Refer Annexure - II)	3	0	0	3	3
7	Engineering Science Course	18CST208	Internet of Things Laboratory	0	0	3	3	1.5
8	Professional Core Course	18CST209	Software Engineering Laboratory	0	0	3	3	1.5
9	Professional Core Course		Virtual Laboratory (Refer Annexure - IV)	0	0	2	2	0
10	Mandatory non-credit Course		Mandatory Course – IV (Refer Annexure - V)	2	0	0	2	0
			Total	**19**	**0**	**8**	**27**	**20**
Summer Internship								

Dept. of Computer Science & Technology

IV Year I Semester

Sl. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
1	Professional Core Course	18CST113	Distributed and Cloud Computing	3	0	0	3	3
2	Professional Core Course	18CST114	Mobile Application Development	3	0	0	3	3
3	Professional Elective Course		Discipline Elective - IV (Refer Annexure - III)	3	0	0	3	3
4	Professional Elective Course		Discipline Elective - V (Refer Annexure - III)	3	0	0	3	3
5	Open Elective Course		Open Elective – III (Refer Annexure - II)	3	0	0	3	3
6	Professional Core Course	18CST210	Distributed and Cloud Computing Laboratory	0	0	2	2	1
7	Professional Core Course	18CST211	Mobile Application Development Laboratory	0	0	2	2	1
8	PROJ - CST	18CST701	Project Work – I	0	0	4	4	2
			Total	**15**	**0`**	**8**	**23**	**19**

Dept. of Computer Science & Technology

IV Year II Semester

Sl. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
1	Professional Elective Course		Discipline Elective – VI (Refer Annexure - III)	3	0	0	3	3
2	Open Elective Course		Open Elective – IV (Refer Annexure - II)	3	0	0	3	3
3	PROJ-CST	18CST702	Project Work - II	0	0	24	24	12
			Total	**6**	**0**	**24**	**30**	**18**

ANNEXURE - I

THREE WEEK MANDATORY INDUCTION PROGRAMME

- Yoga and Meditation
- Sports and Games
- NSS
- NCC
- MITS Social Responsibility Club
- Management module
- Design Thinking
- Spoken and Written Communication

- ***Proficiency modules***

- Basic Computer Proficiency
- Interpersonal skills
- Computer Graphics
- Web programming
- Mobile Apps
- Vocabulary enhancement

HOLISTIC DEVELOPMENT ACTIVITIES

Description of Activities

1. Physical and Health
2. Culture
3. Literature and Media
4. Social Service
5. Self-Development
6. Nature and Environment
7. Innovation

ANNEXURE – II

OPEN ELECTIVE – I

(To be offered under MOOC's Category from SWAYAM – NPTEL)
Students can opt to be assessed either in Conventional mode or through proctored exams conducted by Swayam NPTEL

Sl. No.	Course Code	Course Title	Course Offered by Department of
1	18ENG3M01/ 18ENG3M01C	Soft Skills	English & Training
2	18ENG3M02/ 18ENG3M02C	Developing Soft Skills and Personality	English & Training
3	18ENG3M03/ 18ENG3M03C	Soft Skill Development	English & Training
4	18HUM3M01/ 18HUM3M01C	Project Management for Managers	Humanities
5	18HUM3M02/ 18HUM3M02C	Ethics in Engineering Practice	Humanities
6	18CE3M01/ 18CE3M01C	Integrated Waste Management for Smart City	Civil
7	18CE3M02/ 18CE3M02C	Soil and Water Conservation Engineering	Civil
8	18CE3M03/ 18CE3M03C	Engineering Geology	Civil
9	18ME3M01/ 18ME3M01C	Six Sigma	Mechanical
10	18ME3M02/ 18ME3M02C	Operations Research	Mechanical
11	18ME3M03/ 18ME3M03C	Design Thinking and Innovation	Mechanical
12	18EEE3M01/ 18EEE3M01C	Non-Conventional Energy Sources	EEE
13	18EEE3M01/ 18EEE3M01C	Design of Photovoltaic Systems	EEE
14	18ECE3M01/ 18ECE3M01C	Semiconductor Opto-Electronics	ECE
15	18ECE3M02/ 18ECE3M02C	Digital VLSI Testing	ECE

Any new Interdisciplinary Course offered by SWAYAM NPTEL can be appended in future.

OPEN ELECTIVE – II (To be offered under Conventional Mode)			
Sl. No.	**Course Code**	**Course Title**	**Course Offered by Department of**
1	18MAT301	Advanced Numerical Methods	Mathematics
2	18MAT302	Engineering Optimization	Mathematics
3	18PHY301	Optical Physics and its Applications	Physics
4	18PHY302	LASER Physics and Advanced LASER Technology	Physics
5	18CHE301	Introduction to Petroleum Industry	Chemistry
6	18CHE302	Green Chemistry and Catalysis for Sustainable Environment	Chemistry
7	18HUM301	Intellectual Property Rights	Humanities
8	18HUM302	Human Resource Development	Humanities
9	18HUM304	National Cadet Corps	Humanities
10	18CE301	Ground Improvement Techniques	Civil
11	18CE302	Environmental Impact Assessment	Civil
12	18CE303	Watershed Management	Civil
13	18ME301	Materials Science for Engineers	Mechanical
14	18ME302	Elements of Mechanical Engineering	Mechanical
15	18ME303	Basic Thermodynamics	Mechanical
16	18EEE301	Industrial Electrical Systems	EEE
17	18EEE302	Introduction to MEMS	EEE
18	18ECE301	Bio-Medical Electronics	ECE
19	18ECE302	VLSI Design	ECE

OPEN ELECTIVE – III (To be offered under MOOC's Category from SWAYAM – NPTEL) Students can opt to be assessed either in Conventional mode or through proctored exams conducted by Swayam NPTEL			
Sl. No.	**Course Code**	**Course Title**	**Course Offered by Department of**
1	18ENG3M04/ 18ENG3M04C	Speaking Effectively	English
2	18HUM3M03/ 18HUM3M03C	Management Information System	Humanities
3	18CE3M03/ 18CE3M03C	Remote Sensing and GIS	Civil
4	18CE3M04/ 18CE3M04C	Water Treatment and Recycling	Civil
5	18ME3M04/ 18ME3M04C	Power Plant Engineering	Mechanical
6	18ME3M05/ 18ME3M05C	Mechatronics and Manufacturing Automation	Mechanical
7	18EEE3M03/ 18EEE3M03C	Introduction to Smart Grid	EEE
8	18ECE3M03/ 18ECE3M03C	Introduction to Embedded Systems	ECE
9	18ECE3M04/ 18ECE3M04C	Embedded System Design with ARM	ECE
10	18ECE3M05/ 18ECE3M05C	Advanced Computer Architecture	ECE
11	18IE3M01/ 18IE3M01C	Introduction to Research	General
Any new Interdisciplinary Course offered by SMAYAM NPTEL can be appended in future			

OPEN ELECTIVE – IV (To be offered under Conventional Mode)			
Sl. No.	**Course Code**	**Course Title**	**Course Offered by Department of**
1	18ENG301	Creative Writing	English
2	18HUM303	Entrepreneurship Development	Humanities
3	18MAT303	Graph Theory	Mathematics
4	18MAT304	Mathematical Modeling and Numerical Simulation	Mathematics
5	18PHY303	Thin Film Technology and its Applications	Physics
6	18CHE303	Introduction to Nano Science and Technology	Chemistry
7	18CHE304	Computational Methods in Materials Science and Engineering	Chemistry
8	18CE304	Green Building and Energy Conservation	Civil
9	18CE305	Environmental Engineering	Civil
10	18ME304	Internet of Manufacturing Things	Mechanical
11	18ME305	Entrepreneurship	Mechanical
12	18ME306	Total Quality Management	Mechanical
13	18EEE303	Robotics	EEE
14	18EEE304	Electrical Safety	EEE
15	18ECE303	Nano Electronics	ECE
16	18ECE304	Wireless Sensor Networks	ECE

ANNEXURE - III

List of Discipline Electives

Discipline Elective – I		
Sl. No.	**Course Code**	**Course Title**
1.	18CST401	Data Mining and Data Warehousing
2.	18CST402	Mobile Computing
3.	18CST403	Artificial Intelligence
4.	18CST404	Web Technologies
5.	18CST405	Digital Image Processing
6.	18CST406	Multimedia Technologies
7.	18CST430	Game Development
8.	18CST431	Database Tuning
Any advanced courses can be appended in future.		

Discipline Elective – II (To be offered under MOOC's Category from SWAYAM – NPTEL) Students can opt to be assessed either in Conventional mode or through proctored exams conducted by Swayam NPTEL		
Sl. No.	**Course Code**	**Course Title**
1.	18CCST4M01/ 18CST4M01C	Blockchain and its Applications
2.	18CST4M02/ 18CST4M02C	Deep Learning
3.	18CST4M03/ 18CST4M03C	Model Checking
4.	18CST4M04/ 18CST4M04C	Social Network
5.	18CST4M05/ 18CST4M05C	Reinforcement Learning
6.	18CST4M06/ 18CST4M06C	Introduction to Machine Learning
7.	18CST4M07/ 18CST4M07C	Ethical Hacking
8.	18CST4M08/ 18CST4M08C	Privacy and Security in Online Social Media
9.	18CST4M09/ 18CST4M09C	Object Oriented System Development Using UML, Java and Patterns
10.	18CST4M10/ 18CST4M10C	Introduction to Industry 4.0 and Industrial Internet of Things
11.	18CST4M11/ 18CST4M11C	Online Privacy
Any other new Disciplinary Course which doesn't exist in the Curriculum can be appended in future.		

Discipline Elective – III		
Sl. No.	**Course Code**	**Course Title**
1.	18CST407	Soft computing
2.	18CST408	Real Time Systems
3.	18CST409	Principles of Information Security
4.	18CST410	Adhoc Wireless Networks
5.	18CST411	Service Oriented Architecture
6.	18CST412	E-Learning Technologies
7.	18CST432	Modeling and Simulation
8.	18CST433	Software Test Automation
Any advanced courses can be appended in future.		

Discipline Elective – IV		
Sl. No.	**Course Code**	**Course Title**
1.	18CST413	Machine Learning
2.	18CST414	Social Network Analysis
3.	18CST415	Cryptography and Network Security
4.	18CST416	Advanced Algorithms
5.	18CST417	Blockchain and Cryptocurrency
Any advanced courses can be appended in future.		

Discipline Elective – V		
Sl. No.	**Course Code**	**Course Title**
1.	18CST418	Big Data Analytics
2.	18CST419	Test Driven Development
3.	18CST420	Augmented Reality and Virtual Reality
4.	18CST421	Wireless Network System
5.	18CST422	Programming Paradigms
6.	18CST423	Human Computer Interaction
Any advanced courses can be appended in future.		

Discipline Elective – VI		
Sl. No.	**Course Code**	**Course Title**
1.	18CST424	Software Defined Networking
2.	18CST425	Large Scale Data Processing
3.	18CST426	C# and .Net Programming
4.	18CST427	Wireless and Sensor Networks
5.	18CST428	Modern Approach to Cyber Security
6.	18CST429	Mastering Virtualization
Any advanced courses can be appended in future.		

ANNEXURE - IV

COMPUTER SCIENCE & TECHNOLOGY - VIRTUAL LABS

Sl. No.	Course Code	Course Title
1	18CST212	Data Mining Laboratory
2	18CST213	Pattern Recognition Laboratory
3	18CST214	Cryptography Laboratory
4	18CST215	Advanced Network Technologies Laboratory
5	18CST216	Natural Language Processing Laboratory

ANNEXURE - V

COMPUTER SCIENCE TECHNOLOGY – MANDATORY COURSES

Sl. No.	Course Code	Course Title
1	18CHE901	Environmental Sciences
2	18HUM902	Indian Constitution
3	18HUM903	Essence of Indian Traditional Knowledge
4	18CE904	Disaster Management

Annexure VI

Honors in Computer Science & Technology

SI.No	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
III Year I Semester								
1	**Professional Elective Course (Choose any two from three courses)**	18HDCST101	Multidisciplinary Research Methods for the Study of Evolution	3	0	0	3	3
2		18HDCST102	Natural Language Processing	3	0	0	3	3
3		18HDCST103	Game Design and Development	3	0	0	3	3
	Sub Total			**6**	**0**	**0**	**6**	**6**
	III Year II Semester							
4	**Professional Elective Course (Choose any two from three courses)**	18HDCST104	High Performance Computing	3	0	0	3	3
5		18HDCST105	Advanced Computer Networks and Communications	3	0	0	3	3
6		18HDCST106	Game Design Studio	3	0	0	3	3
	Sub Total			**6**	**0**	**0**	**6**	**6**
	IV Year I Semester							
7	**Professional Elective Course (Choose any one from three courses)**	18HDCST107	Evolutionary Computing	3	0	0	3	3
8		18HDCST108	Advanced Software Engineering	3	0	0	3	3
9		18HDCST109	Experiential Learning in Data Science	3	0	0	3	3
10	**Project**	18HDCST701	Mini Project	0	0	10	10	5
			Sub Total	**3**	**0**	**10**	**13**	**8**
			Total	**15**	**0**	**10**	**25**	**20**

Annexure VII

Minors in Computer Science & Technology
(Applicable to CE, EEE, ME and ECE)

Stream Name: Data Analytics (DA)

SI.No	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
III Year I Semester								
1	**Professional Core Course**	18MDCST101	Design and Analysis of Algorithms	3	0	0	3	3
2	**Professional Core Course**	18MDCST102	Database Management Systems	3	0	0	3	3
III Year II Semester								
3	**Professional Core Course**	18MDCST103	Big Data Analytics	3	0	0	3	3
4	**Professional Core Course**	18MDCST104	Data Science	3	0	0	3	3
5	**Professional Core Course**	18MDCST201	Big Data Management and Data Analytics Laboratory	0	0	4	4	2
IV Year I Semester								
6	**Professional Elective Course**	18MDCST105	Data Mining and Data Warehousing	3	0	0	3	3
7	**Project**	18MDCST701	Mini Project	0	0	6	6	3
			Total	**15**	**0**	**10**	**25**	**20**

B. Tech I Year I Semester

Dept. of Computer Science & Technology

B. Tech I Year I Semester

18ENG101 PROFESSIONAL ENGLISH
(Common to all branches)

L	T	P	C
2	0	2	3

Course Prerequisite: None

Course Description: Communication takes place in many forms, however the major impact and effectiveness is in its professionalism. This course defines, enlightens and enables learners to engage in Professional Communication by addressing all the areas of communication – Listening, Speaking, Reading and Writing. This course also deals with various types of communication – Verbal, Non-verbal, Storytelling, Crucial Conversations, Written Communication, Vocalics, Eye Contact, Posture, etc.

Course Objectives:
This course enables the student to:
1. Engage effectively in a professional environment
2. Understand the intricacies and implications of professional communication
3. Use linguistic skills in any given context
4. Conduct self in a learning environment
5. Be better prepared for employment

UNIT I GRAMMAR & VOCABULARY
Grammar - Tense, Reported Speech, Modals, Conditionals; Vocabulary development - prefixes, suffixes, compound words, synonyms & antonyms. **(6)**

Practical: Dumb Charade, Giving Direction, Talking about an experiment (Tenses), Running Commentary. **(6)**

UNIT II READING SKILLS & WRITTEN COMMUNICATION
Reading - short comprehension passages, practice in skimming, scanning and predicting; Writing- completing sentences, developing hints; Paragraph writing- topic sentence, main ideas, coherence **(6)**

Practical: Short Passages – Reading Comprehension, Paragraph Writing, Skit Writing. **(6)**

UNIT III VERBAL & NON-VERBAL ASPECTS
Verbal - Introducing oneself, exchanging personal information, Using 'Wh'- Questions, asking and answering, yes or no questions- asking about routine actions and expressing opinions;
Non-Verbal – Use of body language, combating nervousness. **(6)**

Practical: Daily Activities, Role Play, JAM **(6)**

UNIT IV CONVERSATIONS
Listening-short texts & conversing, formal and informal conversations, short group conversations, speaking about oneself, speaking about one's friend. **(6)**

Practical: Speaking: formal and informal conversations, short group conversations, speaking about oneself, speaking about one's friend, Character Portrayal.

Listening: Listening/watching interviews, conversations, documentaries, etc.; Listening to lectures, discussions from TV/Radio/Podcast. **(6)**

UNIT V BUSINESS ENVIRONMENT & ETIQUETTES

Sharing information of a personal kind - greeting & taking leave; Writing e-mails, memos, reports, etc. **(6)**

Practical: Mock Interview, Oral Presentation **(6)**

Course Outcomes:

At the end of the course, learners will be able to

1. Read articles and understand professional communication
2. Participate effectively in informal conversations
3. Introduce themselves and their friends and express opinions in English
4. Comprehend conversations and short talks delivered in English
5. Write short essays of a general kind and personal letters and emails in English.

Suggested Reading/Textbooks:

1. Guy Brook Hart & Norman Whitby; *Cambridge English-Business Benchmark: Pre-Intermediate to Intermediate*; Published by: Cambridge University Press.
2. Adrian Doff, Craig Thaine, Herbert Puchta, et al; *Empower: Intermediate (B1+)*; Published by: Cambridge University Press.

Reference:

1. AJ Thomson & AV Martinet; *A Practical English Grammar*; Oxford University Press, 2015.
2. Raymond Murphy; *English Grammar in Use with CD*; Cambridge University Press, 2013.
3. K.S. Yadurajan; *Modern English Grammar*; Oxford University Press, 2014.
4. William Strunk Jr; *The Elements of Style*; ITHACA, N.Y.; W.P. HUMPHREY, 2006.
5. Joseph Devlin; *How to Speak and Write Correctly*; ITHACA, N.Y.; W.P. HUMPHREY, 2006
6. Anjana Agarwal; *Powerful Vocabulary Builder*; New Age Publishers, 2011.
7. *Writing Tutor*; Advanced English Learners' Dictionary; Oxford University Press, 2012.
8. *www.cambridgeenglish.org/in/*
9. https://learnenglish.britishcouncil.org/en/english-grammar
10. https://www.rong-chang.com/

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

B.Tech. I Year I Semester

18MAT101 ENGINEERING CALCULUS

L	T	P	C
3	1	0	4

Course Prerequisite: Intermediate

Course Description:
The course introduces the concepts of single variable and multivariable calculus with the view of its applications in various engineering fields. The course will well prepare the students to develop the solution methods and enrich their experience in critical analysis and problem solving.

Course Objectives:
The objective of this course is to familiarize the prospective engineers with techniques in calculus and multivariate analysis. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

UNIT I CALCULUS
Definite integrals; Applications of definite integrals to evaluate area and length of curves, surface areas and volumes of revolutions; Beta and Gamma functions and their properties **(12)**

Unit II CALCULUS
Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms, Maxima and minima. **(12)**

UNIT III SEQUENCES AND SERIES
Convergence of sequence and series, tests for convergence, power series, Taylor's series. Series for exponential, trigonometric and logarithmic functions; Fourier series: Half range sine and cosine series, Parseval's theorem. **(12)**

UNIT IV MULTIVARIABLE CALCULUS (DIFFERENTIATION)
Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers. **(12)**

UNIT V MULTIVARIABLE CALCULUS (INTEGRATION)
Multiple Integration: double integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by (double integration), triple integrals, curl and divergence, Theorems of Green, Gauss and Stokes (without proofs). **(12)**

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Evaluate the definite integrals to curvatures and infer the Beta and Gamma functions.
2. Analyze the fundamental theorems of calculus to Engineering problems.
3. Use the power series and Fourier series for learning advanced Engineering Mathematics.
4. Apply the functions of several variables and geometrical ideas to engineering.
5. Calculate the area and volume of quantities and connecting them to single double and triple integrals.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42th Edition, 2012.
2. G. B. Thomas, Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas' Calculus Pearson education 11th Edition, 2004.

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11^{th} Reprint, 2010.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

B. Tech I Year I Semester

18CHE101 ENGINEERING CHEMISTRY

L	T	P	C
3	0	0	3

Course Pre-requisite: Basic Chemistry at Intermediate or equivalent level.

Course Description:
Deals with the basic principles of various branches of chemistry like physical, organic, analytical and nanomaterial chemistry.

Course Objectives:
1. Students will understand, analyse and determine the impurities present in the water.
2. Appreciate the synthetic organic reactions used in daily life
3. Learn the principles of spectroscopies to analyse them.
4. Value the basic concepts of thermodynamics and electrochemistry.
5. Be exposed to the importance of nano and engineering materials used in their daily life.

UNIT I IMPURITIES PRESENT IN WATER AND WATER TREATMENT
Impurities in water (BIS and WHO standards), Hardness of water, determination of hardness by EDTA Method (numerical problems), Disadvantages (industry level) of using hard water, Alkalinity of water and its importance, Chlorides, Softening of water by Reverse Osmosis method. Water treatment for civic applications: coagulation, sedimentation, filtration, sterilization - chlorination and ozonization. Concept of break point chlorination. **(9)**

UNIT II PERIODIC PROPERTIES AND ORGANIC REACTIONS
Electronic configurations, atomic and ionic sizes, ionization energies, oxidation states, molecular, geometries, Introduction to substitution, addition, elimination, oxidation, and reduction reactions. **(9)**

UNIT III SPECTROSCOPY
Basic principle and applications of Electronic, Fluorescence, Vibrational and Rotational spectroscopy. Magnetic resonance imaging. **(9)**

UNIT IV FREE ENERGY IN CHEMICAL EQUILIBRIA
Thermodynamics: Systems, State Functions, Thermodynamic functions: Work, Energy, Entropy and Free energy. Estimations of entropy in various processes and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Batteries (Pb-acid, Li-ion) and Fuel-Cells (H_2-O_2). Corrosion: Factors influencing Corrosion, Protective coatings. **(9)**

UNIT V ENGINEERING MATERIALS, NANOSCIENCE & NANOTECHNOLOGY
Cement Materials - Lime, Cement, Gypsum. Lubricants – definition, classification, Extreme pressure lubrication mechanism, important properties – viscosity, viscosity index, saponification number, flash point and pour point. Nanomaterials: Introduction, Classes/Types, Structure-Property relationship; Chemical synthesis of nanomaterials: sol-gel, Hydrothermal and Chemical Vapor Deposition method, Characterization by powder XRD (Scherrer's equation), SEM. Applications of nanomaterials – Catalysis, Electronics & Telecommunication, Medicines, Energy and Environmental Sciences. **(9)**

Course Outcomes:

At the end of the course, the students will be able to

1. Analyze and determine the impurities in water such as hardness, alkalinity for sustainable development.
2. Prepare organic compounds/polymers for environmental, safety and society need.
3. Comprehend the principles and applications of spectroscopies
4. Apply the concept of free energy in thermodynamics, electrochemistry for solving the problems evolve in the engineering processes.
5. Acquire spotlight to the nanomaterials and basic engineering materials used in academics, industry and daily life.

Text Books:

1. "Atkins' Physical Chemistry", P.W. Atkins & Julio de Paula, Ninth edition (Oxford University Press, Oxford 2010).
2. Fundamentals of Molecular Spectroscopy, by C. N. Banwell, Fourth Edition, (Tata McGraw Hill, 2008).
3. Engineering Chemistry, Dr. S. S. Dara and Dr. S. S. Umare, (S. Chand & Company Ltd., 2013).
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan.

Reference Books:

1. 'Physical Chemistry', D. W. Ball, First Edition, India Edition (Thomson, 2007).
2. Perry's Chemical Engineers' Handbook, Perry and Green, 9th Edition, Section 2, McGraw Hill
3. Engineering Chemistry, Dr. Suba Ramesh and others, 1st Edition, Wiley India, 2011.
4. Engineering chemistry, K. N Jayaveera, G. V. Subba Reddy and C. Rama Chandraiah, 1st Edition, McGraw Hill education 2013.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

B. Tech. I Year I Semester

18ME101 ENGINEERING GRAPHICS

L	T	P	C
2	**0**	**3**	**3.5**

Course Prerequisite: None

Course Description:
Introduction to AutoCAD commands, simple drawings, orthographic projections, projection of points, lines, planes; auxiliary projections; projections and sections of solids; development and intersection of surfaces; isometric projections.

Course Objectives:
1. Engineering Graphics is the primary medium for development and communicating design concepts.
2. Through this course the students are trained in Engineering Graphics concepts with the use of AutoCAD.
3. The latest ISI code of practice is followed while preparing the drawings using AutoCAD.
4. Computerized drawing is an upcoming technology and provides accurate and easily modifiable graphics entities.
5. Storage and Retrieval of Drawings is also very easy and it takes very less time to prepare the drawings. Also enhances the creativity.

UNIT I: INTRODUCTION TO AUTO CAD
Introduction to AutoCAD commands, simple drawings, Orthographic Projections-Theory, techniques, first angle projections and third angle projections. **(10)**

UNIT II: PROJECTIONS OF POINTS & LINES
Projections of points: Positions, notation system and projections. Projections of lines: positions, terms used, different cases, traces of lines and finding true lengths, auxiliary projections. **(10)**

UNIT III: PROJECTIONS OF PLANES & SOLIDS
Projections of planes: positions, terms used, different cases and projections procedure. Projections of Solids: Projections of Regular Solids inclined to one planes. **(10)**

UNIT IV: SECTIONS AND DEVELOPMENTS OF SOLIDS
Section Planes and Sectional View of Right Regular Solids-Prism, cylinder. True shapes of the sections. Development of Surfaces of Right Regular Solids-Prism, Cylinder and their Sectional Parts. **(10)**

UNIT V: INTERSECTIONS & ISOMETRIC PROJECTIONS
Intersections of surfaces of solids: Intersection between: Line-plane, Plane-plane, line-solid, solid-solid. **Isometric Projections**: Theory of isometric drawing, construction of isometric projection from orthographic. **(10)**

Course Outcomes:

The students after completing the course will be able to:
1. Identify various commands in AutoCAD and their usage for engineering graphics
2. Draw the projections of points and straight lines with AutoCAD
3. Draw the projections of the planes and sections of solids.

4. Sketch the intersections of surfaces and developments of solids
5. Draw the conversion of the orthographic views to isometric views and vice versa.

Text Books:

1. D.M. Kulkarni, A.P. Rastogi and A.M. Sarkar., Engineering Graphics with AutoCAD, PHI Learning Private Limited, New Delhi 2009.

References:

1. Dhananjay A Jolhe, Engineering Drawing: with an introduction to AutoCAD, Tata McGraw Hill, 2008
2. Warren J. Luzadder& Jon M. Duff Fundamentals of Engineering Drawing, 11th edition, Prentice Hall of India, New Delhi.ss

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech. I Year I Semester

18CSE101 PROGRAMMING FOR PROBLEM SOLVING (PYTHON)

L	T	P	C
2	0	2	3

Course Prerequisite: None

Course Description:
Python is a language with a simple syntax, and a powerful set of libraries. It is an interpreted language, with a rich programming environment. While it is easy for beginners to learn, it is widely used in many scientific areas for data exploration. This course is an introduction to the Python programming language for students without prior programming experience. This course provides knowledge on how to implement programs in python language and to solve computational problems using the various programming constructs including data structures, functions, string handling mechanisms and file handling concepts.

Course Objectives:
1. Learn Python programming constructs.
2. Implement Python programs with conditional structures and loops.
3. Use functions for structuring Python programs.
4. Handle compound data using Python lists, tuples, and dictionaries.
5. Manipulate data using files handling in Python.

UNIT-I
Introduction: Algorithms, building blocks of algorithms (flow chart), History of Python, features of Python Programming, Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation. **Data Types -** Integers, Strings, Boolean.

a) Develop a flowchart for the various arithmetic operations on numbers.
b) Develop a flowchart to check whether the number is positive or negative.
c) Develop a flowchart for finding whether a given number is even or odd.
d) Develop a flowchart for finding biggest number among three numbers.
e) Develop a flowchart for displaying reversal of a number.
f) Develop a flowchart to print factorial of a number using function.
g) Develop a flowchart to generate prime numbers series up to N using function.
h) Develop a flowchart to check given number is palindrome or not using function.
i) Alexa travelled 150 kms by train. How much distance in miles she actually covered?

(10)

UNIT-II
Operators and Expressions: Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations. **Control Flow** - if, if-elif-else, for, while, break, continue, pass.

a) Swapping of two number with and without using temporary variable.
b) If the age of Ram, Sam, and Khan are input through the keyboard, write a python program to determine the eldest and youngest of the three.

c) Develop a program that performs arithmetic operations (Addition, Subtraction, Multiplication, and Division) on integers. Input the two integer values and operator for performing arithmetic operation through keyboard. The operator codes are as follows:
   - For code '+', perform addition.
   - For code '-', perform subtraction.
   - For code '*', perform multiplication.
   - For code '/', perform division.

d) Implement the python program to generate the multiplication table.

e) Implement Python program to find sum of natural numbers

f) If the first name of a student is input through the keyboard, write a program to display the vowels and consonants present in his/her name.

g) The marks obtained by a student in 5 different subjects are input through the keyboard. Find the average and print the student grade as per the MITS examination policy as shown below.

% OBTAINED	GRADE
90 – 100	O (Outstanding)
80 – 89	A+ (Excellent)
70 – 79	A (Very Good)
60 – 69	B+ (Good)
50 – 59	B (Above)
45 – 49	C (Average)
40 – 44	P (Pass)
< 40	F (Fail)

h) Implement Python Script to generate prime numbers series up to N.

i) Given a number x, determine whether it is Armstrong number or not. Hint: For example, 371 is an Armstrong number since 3**3 + 7**3 + 1**3 = 371. Write a program to find all Armstrong number in the range of 0 and 999.

(10)

UNIT-III

Data Structures Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions. **Functions** - Defining Functions, Calling Functions, Passing Arguments, variable in python-Global and Local Variables.

a) Write a Python script to
   - create a list
   - access elements from a list
   - slice lists
   - change or add elements to a list
   - delete or remove elements from a list

b) Write a Python script to read the values from a list and to display largest and smallest numbers from list.

c) Write a Python script to compute the similarity between two lists.

d) Write a Python script to read set of values from a Tuple to perform various operations.

e) Write a Python script to perform basic dictionary operations like insert, delete and display.
f) Write a Python program to count the occurrence of each word in a given sentence.
g) Define a dictionary named population that contains the following data.

Keys	Values
Shanghai	17.8
Istanbul	13.3
Karachi	13.0
Mumbai	12.5

h) Write a Python script to create Telephone Directory using dictionary and list to perform basic functions such as Add entry, Search, Delete entry, Update entry, View and Exit.
i) Implement Python script to display power of given numbers using function.
j) Implement a Python program that takes a list of words and returns the length of the longest one using function.

(10)

UNIT-IV

String Handling - Modules: Creating modules, import statement, name spacing - **Files and Directories**

a) Implement Python program to perform various operations on string using string libraries.
b) Implement Python program to remove punctuations from a given string.
c) Write a Python program to change the case of the given string (convert the string from lower case to upper case). If the entered string is “computer”, your program should output “COMPUTER” without using library functions.
d) Implement Python program to capitalize each word in a string. For example, the entered sentence “god helps only people who work hard” to be converted as “God Helps Only People Who Work Hard”
e) Write a Python script to display file contents.
f) Write a Python script to copy file contents from one file to another.
g) Write a Python script to combine two text files contents and print the number of lines, sentences, words, characters and file size.
h) Write a Python commands to perform the following directory operations.
   - List Directories and Files
   - Making a New Directory
   - Renaming a Directory or a File
   - Removing Directory or File

(10)

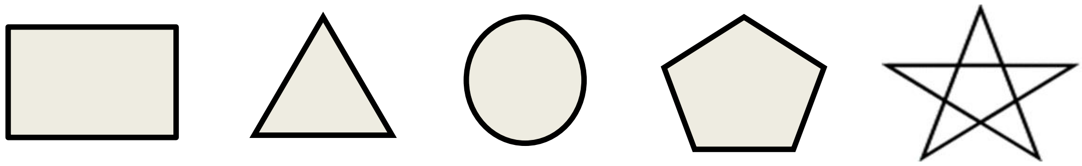
UNIT-V

Python packages, Introduction to PIP, Installing Packages via PIP (Numpy, Pandas etc.), Using Python Packages.

Brief Tour of the Standard Library - Dates and Times, Data Compression, Turtle Graphics.

a) Create a package named Cars and build three modules in it namely, BMW, Audi and Nissan. Illustrate the modules using class. Finally, we create the __init__.py file. This file will be placed inside Cars directory and can be left blank or we can put the initialization code into it.

b) Write a python script to display following shapes using turtle.



(10)

Course Outcomes:

At the end of the course, students will be able to

1. Understand problem solving techniques and their applications.
2. Apply the basic elements and constructs of python to solve simple logical problems.
3. Demonstrate different data structures using functions.
4. Demonstrate different file operations and modules.
5. Apply object-oriented principles to build simple applications.

Text Book:

1. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist’’, 2nd edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)

2. Guido van Rossum and Fred L. Drake Jr, “An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

References:

1. Charles Dierbach, “Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.

2. John V Guttag, “Introduction to Computation and Programming Using Python’’, Revised and expanded Edition, MIT Press , 2013.

3. Kenneth A. Lambert, “Fundamentals of Python: First Programs”, CENGAGE Learning, 2012.

4. Paul Gries, Jennifer Campbell and Jason Montojo, “Practical Programming: An Introduction to Computer Science using Python 3”, Second edition, Pragmatic Programmers,LLC,2013.

5. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Dept. of Computer Science & Technology

B. Tech I Year I Semester

18CHE201 CHEMISTRY LABORATORY

L	T	P	C
0	0	3	1.5

Course Prerequisites: Intermediate

Course Description:
It deals with basic principles of volumetric and instrumental analytical methods.

Course Objective:
This Engineering Chemistry Laboratory is common to all branches of I Year B Tech. At the end of the course the student is expected to Students will learn to estimate the chemical impurities present in water such as hardness, alkalinity, chlorine, etc.

1. Understand and experience the synthetic methods for the preparation of a polymer / inorganic (or) organic compounds.
2. Be trained to use the instruments for to practically understand concepts of electrochemistry.
3. Bridge theoretical concepts and their practical engineering applications, thus highlighting the role of chemistry in engineering
4. Learn and understand the practical implementation of fundamental concepts.

CHOICE OF 10 EXPERIMENTS FROM THE FOLLOWING

1. Estimation of total, permanent and temporary hardness of water by EDTA method.
2. Estimation of Chloride content in bleaching powder.
3. Estimation of alkalinity of water sample.
4. Determination of rate constant of a chemical reaction/process
5. Adsorption of acetic acid by charcoal.
6. Determination of rate of corrosion by colorimetry (Galvanized steel and $CuSO_4$).
7. Synthesis of a polymer and determination of molecular weight by measuring viscosity.
8. Saponification/acid value of an oil.
9. Synthesis of an inorganic complex.
10. Synthesis of a simple organic compound / Preparation of Thiokol Rubber.
11. Determination of strength of an acid Pb-Acid battery by conductometric titration (Neutralisation Titration).
12. Conductometric titration of BaCl2 Vs Na2SO4 (Precipitation Titration).
13. Dissociation constant of weak electrolyte by Conductometry.
14. Determination of percentage of Iron in Cement sample by colorimetry.
15. Estimation of ferrous ion by potentiometric titration (Redox Titration).

Course Outcomes:

After the completion of the Engineering Chemistry Laboratory experiments, students will be able to

1. Develop and perform analytical chemistry techniques to address the water related problems (for e.g., hardness, alkalinity, dissolved oxygen present in water) technically.
2. Synthesize and analyse the given chemical compound / material for engineering applications towards the needs of the society, environment, etc.
3. Procure practical skills to handle spectroscopic methods to understand the rate of corrosion, colour and much more topics applicable in industry.
4. Operate various instruments for the analysis of materials and produce accurate results in a given time frame.
5. Think innovatively and improve the creative skills that are essential for solving engineering problems.

Text Book:

1. Engineering Chemistry Lab Manual, Dept. of Chemistry, Madanapalle Institute of Technology and Science, Madanapalle – 517325, Chittoor Dist., Andhra Pradesh, India.
2. "Vogel's Textbook of Qualitative Chemical Analysis", Arthur Israel Vogel, Prentice Hall, 2000.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Dept. of Computer Science & Technology

B. Tech. I Year I Semester

18CSE202 ENGINEERING & IT WORKSHOP

L	T	P	C
0	0	3	1.5

Course Prerequisite: None

Course Description:
This course will provide students with a hands-on experience on various basic engineering practices CSE and presenting the final product design.

Course Objective
1. Introduction to the use of Tools and Machinery in foundry, forging, tinsmith, carpentry, welding, fitting, working, fabrication of plastic components, fabrication of polymer composite materials, simple machine turning and wood turning, basic electrical connections
2. Introduction of basic electrical engineering
3. Fabrication of final product design at end of the semester.

LIST OF EXPERIMENTS
1. Carpentry (Cross half lap Joint and Miter Joint)
2. Fitting (Square and 'V' fit)
3. Sheet Metal - Tin smithy (Square tray)
4. Foundry (Solid and Split pattern)
5. Welding (Arc and Gas welding) – SingleV Butt Joint, T-fillet Joint
6. Plastic fabrication (Pen Stand)
7. Metrology (Internal and External dimension)
8. Introduction of Power Tools and CNC (Demo Only)
9. Introduction to 3D Printing (Demo Only)

Course Outcomes: On successful completion of this course, the student will be able to
1. Fabricate carpentry components with suitable joint and pipe connections including plumbing works.
2. Practice the welding equipment to join the structures
3. Effective the basic machining operations
4. Create the models using sheet metal and plastic works.
5. Illustrate the operations of foundry, fitting and smithy
6. Fabrication product in composite material and product in plastic material
7. Conduct experiment basic electrical wire connection
8. Design and fabrication of final product design

Suggested Text/Reference Books:

(i) Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

(ii) Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.

(iii) Gowri P. Hariharan and A. Suresh Babu, “Manufacturing Technology – 1” Pearson Education, 2008.
(iv) Roy A. Lindberg, “Processes and Materials of Manufacture”, 4th edition, Prentice Hall India, 1998. (v) Rao P.N., “Manufacturing Technology”, Vol. I and Vol. II, Tata McGrawHill House, 2017.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Dept. of Computer Science & Technology

IT WORKSHOP

	L	T	P	C
Course Prerequisite: None	**0**	**0**	**3**	**1.5**

Course Description:
This course helps the students to understand the basic components of a computer, installation of operating systems, working on productivity tools Word power, point excel. Also it gives a basic understanding of using Google tools and various emails setting in Gmail.

Course Objectives:
1. The course focuses on enhancing student knowledge in computer peripherals and assembling.
2. To install operating system on computers and create new email account.
3. To understand basic software like WinRAR, WinZip, PDF readers and web browser.
4. To provide technical training to the students on Google tools like forms, calendar, drive, translate and Photo.
5. To make the students to install software like JDK, Turbo C compiler and .net

LIST OF EXPERIMENT

1. Components of Computer & Assembling a Computer:

Learning about the different parts of the computer and its advancement

- Processor
- Memory – Types
- Motherboard
- Peripheral interfaces – I/O devices
- Learn about the proper connectivity among the devices inside the PC
- Assembling the different parts of the computer inside the cabinet

2. Install Operating System

- Partition the disk drive based on the capacity and the OS to be installed using utility tools
- Install Windows
- Install Linux or Ubuntu - use command line installation

3. Basic PC Troubleshooting

- Awareness on the possible issues in a computer
- Troubleshooting the problems using the available tools
- Removal and repair of existing software
- Identification of suitable Device driver for Hardware Devices.

4. Learning Basic Software:

- Installation of Productivity tools like WinRAR, WinZip, and PDF Reader.
- Installation of Image Editor and Web browsers.
- Basic Software installation in Linux based system.
- Connect the Printer and Scanner Devices perform printing and scanning operation.

5. Productivity Tools (Office 365):

- Generate, manipulate, search, aligning content using MS Word.

- Creation of Excel sheet with various column and rows applying various Excel formulas.
- Create Presentation and Visualization – graphs, charts, 2D, 3D.
- Create a database template using MS Access.
- Draw flowchart using the Drawing tools – Google Quick draw,sketchup,

6. Introduction to Google Tools
   - Design a Google form and collect a response date among students using Google Form.
   - Schedule One day of your activities using Google Calendar.
   - Store and Retrieve Date from cloud storage using Google Drive.
   - Translate the English language sentence to Telugu sentence using Google Translate
   - Organizing photo and editing photo using Google Photos.

7. Exploring Email
   - Creation, Composing and Sending the E-mail.
   - Use High Priority setting to categories the mail.
   - Create a Folder in different Categories and move the received mail to Folder.
   - Unsubscribing unwanted emails
   - Enable settings for automatic reply

Add_on content:

Networking Commands: ping, ssh, ifconfig, scp, ipconfig, traceroute, nslookup, getmac

Technical Stack :Windows 7 /UbantuOs – Winrar,Winzip,PDF reader, Office Package.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand the working principles of computer hardware
2. Demonstrate Installation of Operating Systems and troubleshooting using utility software.
3. Demonstrate Installation of basic application software.
4. Experiment various applications of MS Office.
5. Practice Google Tools and Email handling for effective communications.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech I Year II Semester

Dept. of Computer Science & Technology

B.Tech. I Year II Semester

18MAT110 LINEAR ALGEBRA

L	T	P	C
3	1	0	4

Course Prerequisite: 18MAT101

Course Description:
Linear algebra is one of the most important subjects in the study of engineering because of its widespread applications in electrical, communications and computer science. The objective of this course is to give a presentation of basic concepts of linear algebra to illustrate its power and utility through applications to computer science and engineering.

Course Objectives:
1. Understanding basic concepts of linear algebra (systems of linear equations, matrix calculus, vectors and basic vector operations).
2. Learn about vector spaces and sub spaces.
3. To become proficiency in solving computational problems of linear algebra.
4. To understand the axiomatic structure of modern mathematics and learn to construct simple proof.
5. Learn to solve Engineering problem.

UNIT I LINEAR EQUATIONS AND MATRICES
System of linear equations – Gaussian elimination/Jordan – block matrices –finding inverse of matrices – elementary matrices – permutation matrix – LDU factorization – applications to cryptography and electrical network **(12)**
.

UNIT II VECTOR SPACE
The n-space R^n and vector space – subspaces – bases – linear combination– span linearly dependent – independent – dimensions – finite dimensional – Row and column spaces – Rank and nullity – Bases for subspace – invertibility – application in interpolation .
(12)

UNIT III LINEAR TRANSFORMATIONS
Basic Properties of Linear transformations – invertible linear transformation – matrices of linear transformations. **(12)**

UNIT IV VECTOR SPACE OF LINEAR TRANSFORMATIONS
Vector space of linear transformations – change of bases – similarity – application to computer graphics. **(12)**

UNIT V INNER PRODUCT SPACES
Dot Products and Inner products – the lengths and angles of vectors – matrix representations of inner products – Gram-Schmidt orthogonalization – orthogonal projections – relations of fundamental subspaces – orthogonal matrices and isometrics– applications to least square solutions. **(12)**

Course Outcomes:

This course meets the following student outcomes:

1. Solve systems of linear equations using Gaussian elimination and matrix inversion.
2. Demonstrate understanding of the concepts of vector space and subspace, linear independence, span, and basis.
3. Apply principles of matrix algebra to linear transformations.
4. Apply principles of vector space to linear transformations.
5. Demonstrate understanding of inner products and associated norms.

Textbook:

1. Jin Ho Kwak and Sungpyo Hong, “Linear Algebra”, Second edition, Birkhaüser, 2004

Reference Books:

1. Stephen Andrilli and David Hecher, Elementary Linear Algebra, 3rd Edition, Academic Press(2006)

2. Charles W. Curtis, Linear Algebra, Springer (2004)

3. Howard Anton and Robert C Busby, Contemporary linear algebra, John Wiley (2003).

4. Gilbert Strang, Introduction to Linear Algebra.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

B. Tech. I Year II Semester

	L	T	P	C
18PHY102 MODERN PHYSICS	**3**	**1**	**0**	**4**

Course Prerequisite: Plus two level physics course

Course Description: Modern Physics for Electrical and Computer Engineers is a basic physics course which provides fundamental knowledge to understand the concepts of Waves, Optics, Quantum Mechanics, Semiconductors and Lasers.

Course Objectives:

1. Expose students in understanding the basic laws of nature through wave equation using the principles of oscillations and waves.
2. Analyze and understand the concepts of waves and optics to prepare the students for advanced level courses.
3. Expose students to theoretical and mathematical aspects of Interference, Diffraction techniques and Lasers for testing of materials.
4. Develop knowledge and understanding the fundamental concepts of Quantum mechanics.
5. Adaptability to new developments in science and technology.

UNIT I: WAVES

Simple harmonic motion, damped harmonic oscillations, forced harmonic oscillations, resonance, and quality factor. Superposition of vibrations along same direction (equal frequency) and in perpendicular directions, Lissajous figures. Transverse waves, one dimensional wave equation, solution for wave equation, velocity of a transverse wave along a stretched string, modes of vibration of stretched string, standing waves, standing wave ratio. **(10)**

UNIT II: OPTICS

Light as an electromagnetic wave, Huygens' Principle, superposition of waves, interference of light by division of wavefront - Young's double slit experiment, expression for fringe width, intensity distribution graph, interference of light by division of amplitude- interference in thin film by reflection, Newton's rings experiment, Diffraction, Farunhofer diffraction due to single slit, double slit and Diffraction grating (N-slit). **(10)**

UNIT III: QUANTUM MECHANICS

Introduction to Quantum Mechanics-Postulates of quantum mechanics, de Broglie's hypothesis, Uncertainty principle (Qualitative only), Time-dependent and time-independent Schrodinger equations for wave function, Free-particle wave function and wave-packets, Solution of wave equation: Solution of stationary-state, Schrodinger equation for one dimensional problems – particle in a box, Scattering from a potential barrier and principle of tunnelling- operation of scanning tunnelling microscope. **(10)**

UNIT IV: SEMICONDUCTORS

Introduction to solids and semiconductors. Free electron theory of metals (drift velocity and electrical conductivity), Fermi energy level, density of states, Kronig-Penney model (Qualitative only) and origin of energy bands, band structure of metals, semiconductors, and insulators. Direct and indirect bandgap semiconductors, Intrinsic and extrinsic semiconductors, Dependence of

Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), p-n junction-IV characteristics. **(10)**

UNIT V: LASERS

Introduction to lasers, characteristics of laser, spontaneous and stimulated emission, Einstein's coefficients; population inversion, excitation mechanisms, types of lasers: solid-state lasers – ruby laser, gas lasers - He-Ne Laser, semiconductor p-n junction diode laser; applications of lasers. **(08)**

Course Outcomes:

Upon successful completion of this course, the students should be able to:

1. Describe a mathematical wave equation using the principles of waves and oscillations
2. Apply the knowledge for materials testing using Interference and Diffraction techniques.
3. Understand the idea of wave function and to solve Schrodinger equation for simple potentials.
4. Explain the role of semiconductors in different realms of physics and their applications in both science and technology.
5. Identify the working elements of different lasers and estimate laser operation parameters.

Textbooks:

1. H. J. Pain, "The physics of vibrations and waves", Wiley, 2006.
2. A. Ghatak, "Optics", McGraw Hill Education, 2012.
3. D. J. Griffiths, "Quantum mechanics", Pearson Education, 2014.
4. B.G. Streetman, "Solid State Electronic Devices", Prentice Hall of India, 1995.
5. O. Svelto, "Principles of Lasers", Springer Science & Business Media, 2010

Reference Books:

1. H. J. Pain, "The physics of vibrations and waves", Wiley, 2006.
2. Physics Vol I & II, Halliday/Resnick/Krane 5th Edition, John Wiley, 2003.
3. D. A. Neamen, "Semiconductor Physics and Devices", Times Mirror High Education Group, Chicago, 1997.
4. G. Aruldhas, "Quantum Mechanics", Prentice Hall India Pvt., Limited 2002.

Mode of Evaluation: Assignment, Classroom participation, Midterm Examinations, Mini project / Term paper and External End Examination.

Dept. of Computer Science & Technology

B. Tech I Year II Semester

18EEE101 BASIC ELECTRICAL ENGINEERING

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description:
This course equips the students with a basic understanding of Electrical circuits and machines for specific applications. In specific, the course covers basic of DC circuit & its analysis, introduction to single-phase and three-phase AC Systems, magnetic circuits, transformers, DC & AC electrical machines, basic converters and Components of LT Switchgear.

Course Objectives:
1. To learn the basics of the D.C. circuit analysis.
2. To have an idea about single-phase and three-phase A.C. electrical circuits.
3. To gain knowledge about basic magnetic circuits and transformers.
4. To learn the construction and operation of D.C. and A.C. machines.
5. To understand the operation of basic rectifiers and various components of LT Switchgear.

UNIT I DC CIRCUIT ANALYSIS
Electrical circuit elements (R, L and C), voltage and current sources, Series and parallel resistive circuits, Kirchhoff's current and voltage laws, Nodal and Mesh analysis of simple circuits with dc excitation. Source Transformation, Star-Delta Transformation, Superposition Theorem. **(9)**

UNIT II AC CIRCUIT ANALYSIS
Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations. Three phase balanced circuits, voltage and current relations in star and delta connections. **(9)**

UNIT III MAGNETIC MATERIALS AND TRANSFORMERS
Magnetic materials, B-H characteristics, ideal and practical transformer, principle of operation, emf equation, equivalent circuit, losses in transformers, regulation and efficiency. **(9)**

UNIT IV DC AND AC MACHINES
Construction, working, emf equation of DC generator, methods of excitation, speed control of dc motor. Generation of rotating magnetic fields, construction and working of a three-phase induction motor. Introduction of Single-phase induction motor. **(9)**

UNIT V RECTIFIERS AND ELECTRICAL INSTALLATIONS
PN junction diode, half wave, full wave and bridge rectifiers. Components of LT Switchgear: switch fuse unit (SFU), MCB, ELCB, MCCB, types of wires and cables, earthing. **(9)**

Course Outcomes:
Upon successful completion of the course, students will be able to
1. To understand and analyze basic DC electric circuits.
2. To measure and analyze various electrical quantities of single phase and three AC electric circuits.
3. To develop magnetic circuits to experiment and analyze the transformers.
4. To study the working principles of electrical machines.
5. To create power converters for domestic applications with LT switchgear.

Textbooks:

1. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
2. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
3. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
4. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
5. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

References:

1. Abhijit Chakrabarti, “Circuit Theory : Analysis and Synthesis”, Dhanpat Rai & Co., 2014
2. J.B. Gupta, “Theory & Performance of Electrical Machines”, S. K. Kataria & Sons, 2013.
3. John Bird, “Electrical Circuit Theory and Technology”, Fourth edition, Elsevier Ltd., 2010.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

B. Tech. I Year II Semester

18CSE102 C PROGRAMMING AND DATA STRUCTURES

L	T	P	C
3	0	0	3

Course Prerequisite: 18CSE101

Course Description:
This course includes C program basics, control structures, arrays, files, pointers and data structures.

Course Objectives:
1. To make the student understand problem solving techniques and their applications
2. Students will be able to understand the syntax and semantics of C programming language
3. Develop algorithms for manipulating stacks, queues, searching and sorting.

UNIT I C PROGRAMMING
Structure of C Program, C Tokens: Variables, Data types, Constants, Identifiers, key words and Operators, Expressions. **Control Structures**: Conditional Statements (Simple if, if-else, Nested -if-else, Switch). Iterative Statements (for, While, Do-While), Jump Statements (break, Continue). **(9)**

UNIT II FUNCTIONS & ARRAY
Functions Introduction, User defined function, accessing a function, Function prototypes, Recursion, storage classes **Arrays**: Defining an array, processing an array, one dimensional arrays, two dimensional arrays. **Searching:** Linear and Binary search **Sorting:** Bubble Sort and Insertion Sort. **(9)**

UNIT III POINTERS AND STRUCTURE
Pointers: Fundamentals of pointer, Pointer Declarations, Parameter passing: Pass by value, Pass by reference – Example Program: Swapping of two numbers and changing the value of a variable using pass by reference. Dynamic memory allocation. **Structures:** Defining a structure, processing a structure. **(9)**

UNIT IV DATA STRUCTURES
Classification of Data Structure, **Stack and Queues:** stack, stack operations, stack implementations using arrays.Queue, queue operations, queue implementations using array, types of queues, applications of stack and queue. **(9)**

UNIT V STRINGS & FILES
Declaring and Defining a string, Initialization of strings, Strings Library functions **Files:** File Definition, Opening and closing a data file, Reading and Writing a data file, Files I/O Functions. **(9)**

Dept. of Computer Science & Technology

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Illustrate the use of control structures, decision making and looping statement.
2. Build programs using arrays and functions.
3. Implement the concepts of pointer, structure, and list.
4. Implement storage and retrieval of ordered data using stacks and queues.
5. Illustrate the concepts of Strings and File processing.

Textbooks:

1 The C Programming Language, Kernighan and Ritchie, 2 nd Edition, Prentice Hall, India 1988.

2 Alfred V. Aho, John E. Hopcroft and Jeffry D. Ullman, Data Structures and Algorithms, Pearson Education, New Delhi, 2006.

References:

1. Programming in ANSI C, E. Balagurusamy, Sixth Edition, Tata Mc-Graw Hill Publishing Co.Ltd.-New Delhi
2. Problem Solving & Program Design in C, Hanly, Jeri R and Elliot. B Koffman, Pearson Education,5th edition, 20007.
3. K. N. King ,"C Programming ": A Modern Approach, 2nd Edition 2nd Edition
4. Byron Gottfried , Jitender Chhabra , Programming with C (Schaum's Outlines Series)

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

B. Tech I Year II Semester

18PHY201 PHYSICS LABORATORY

Course Prerequisite: None

L	T	P	C
0	0	3	1.5

Course Description:
Physics Practical course is meant for making the students to gain practical knowledge to co relate with the theoretical studies. It covers experiments on Principles of Mechanics and Optics, Measurement of Magnetic field and studying Resonance using LCR Circuit.

Course Objectives:
1. Elucidate the concepts of Physics through involvement in the experiment by applying theoretical knowledge.
2. Illustrate the basics of mechanics, waves and opticsto analyze the behavior and characteristics of various materials for its optimum utilization.
3. Develop an ability to apply the knowledge of physics experiments in the later studies.

LIST OF EXPERIMENTS: (Any 10 Out of 12)

1. Spring constant - Coupled Pendulums
2. Study of resonance effect in series and parallel LCRcircuit
3. Determination of radius of curvature of a curved surface - Newton’s Rings
4. Wavelength of a laser - Diffraction Grating
5. Wavelength of the spectral lines - Diffraction Grating
6. Magnetic field along the axis of a current carrying coil - Stewart Gees’ Apparatus
7. Ferroelectric hysteresis
8. Thickness of a given wire - Wedge Method
9. Dispersive power of prism – Spectrometer
10. Frequency of the tuning fork - Melde’s apparatus
11. Energy gap of a material of p-n junction.
12. Width of single slit - Diffraction due to Single Slit

Course Outcomes:
Upon successful completion of this course, the students should be able to:
1. Apply the scientific process in the conduct and reporting of experimental investigations.
2. Understand measurement technology, usage of new instruments and real time applications in engineering studies.
3. Verify the theoretical ideas and concepts covered in lecture by doing hands on in the experiments.
4. Know about the characteristics of various materials in a practical manner and gain knowledge about various optical technique methods.
5. Acquire and interpret experimental data to examine the physical laws.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech. I Year II Semester

18EEE201 ELECTRICAL ENGINEERING LABORATORY

L	T	P	C
0	0	3	1.5

Course Prerequisite: None

Course Description:

The laboratory facilitates the students to deal with electrical instruments which further strengthen the concepts & operation of various AC & DC circuits, and machines, and their characteristics. The lab also reinforce the concepts discussed in class with a hands-on approach which enable the students to gain significant experience with electrical instruments such as ammeter, voltmeter, digital multimeters, oscilloscopes, tachometer, switches, fuses and power supplies.

Course Objectives:

1. To provide hands on experience in setting up simple electrical circuits (DC and AC).
2. To get exposure to handle different electrical equipment's.
3. To measure various electrical parameters with different measuring instruments.
4. To get hands on experience in operating DC and AC machines.
5. To understand the operation of basic converters and various components of LT Switchgear.

LIST OF LABORATORY EXPERIMENTS/DEMONSTRATIONS

DEMONSTRATIONS:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Demonstration of voltage and current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). In star and delta connections.
3. Demonstration of cutout sections of transformer and DC & AC machines.
4. Demonstration of induction machine. Motor operation and generator operation of an induction machine driven at super-synchronous speed.
5. Familiarization of (i) different types of cables/wires and switches and their uses, (ii) different types of fuses & fuse carriers; MCB, ELCB, MCCB their ratings and uses (components of LT switchgear).

EXPERIMENTS:

1. Wiring of a simple circuit for controlling a lamp/fan point.
2. Wiring of a power circuit for controlling an electrical appliance (16A Socket).
3. Verification of Kirchhoff's current and voltage laws (KCL & KVL).
4. Verification of superposition theorem
5. Sinusoidal steady state response of R-L, and R-C circuits (impedance calculation and verification).
6. Measurement of voltage, current and power in a single-phase circuit using voltmeter, ammeter and wattmeter. Also, calculate the power factor of the circuit.
7. Measurement of active power for star and delta connected balanced loads (single wattmeter method).
8. Open-circuit and short-circuit test on a single-phase transformer.
9. Speed control of separately excited DC motor.
10. Wiring of a power distribution arrangement using single phase MCB distribution board with ELCB, main switch and energy meter (or residential house wiring).

Course Outcomes:

Upon successful completion of the course, the students are expected to

1. Get an exposure to common electrical components and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Understand the usage of common electrical measuring instruments.
4. Understand the basic characteristics of transformers and electrical machines.
5. Get an exposure to the working of various power electronic converters.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Dept. of Computer Science & Technology

B. Tech. I Year II Semester

18CSE201 C PROGRAMMING AND DATA STRUCTURES LABORATORY

L	T	P	C
0	0	3	1.5

Course Prerequisite: 18CSE101

Course Description:
This course includes C program basics, control structures, arrays, files, pointers and data structures.

Course Objectives:
1. To make the student understand problem solving techniques and their applications
2. Students will be able to understand the syntax and semantics of C programming language
3. Develop algorithms for manipulating linked lists, stacks, queues, searching and sorting.

LIST OF EXPERIMENTS

1. a) Write a C program to swap the two numbers.
   b) Write a C Program to find the eligibility of admission for a Professional course based on the following criteria:
      Marks in Maths >=65
      Marks in Physics >=55
      Marks in Chemistry>=50
      OR
      Total in all three subject >=180

2 a) Write a C program to list all the factorial numbers less than or equal to an input number n.
      A number N is called a factorial number if it is the factorial of a
      Positive integer. For example, the first few factorial numbers are
      1, 2, 6, 24, 120, ...
      Note - We do not list the factorial of 0.
   b) Write a program that reads numbers which are in the range 0 to 100, till it encounters -1. Print the sum of all the integers that you have read before you encountered -1

3 a) Given three points (x1, y1), (x2, y2) and (x3, y3), write a program to check if all the three points fall on one straight line.
   b) The digital root (also called repeated digital sum) of a number is a single digit value obtained by an iterative process of summing digits. Digital sum of 65536 is 7, because 6+5+5+3+6=25 and 2+5 = 7.
   Write a program that takes an integer as input and prints its digital root.

4. a) Write a C program to find the series of prime numbers in the given range.
   b) Write a C Program to Check Whether a Number is Palindrome or Not.

5. a) Write a c program to check whether a given number is a perfect number or not. (Perfect number is a positive number which sum of all positive divisors excluding that number is equal to that number. For example 6 is perfect number since divisor of 6 are 1, 2 and 3. Sum of its divisor is 1 + 2+ 3 = 6)
   b) Write a C function to find the kth occurrence of an integer n in a sequence of non-negative integers, and then call your function from main.

Your function should be according to the following declaration:

int find(int n, int k);

sample example: input 3 2

1 1 3 2 3 -1

Output: 4

6) Write a C program to find Factorial, GCD, Fibonacci, (Using recursion)

7. Your program should take as input: dimension of a square matrix N, two matrices of size N x N with integer values, and one operator symbol (+, - ,*). It must perform the Corresponding operation given below
   a) Matrix Addition b) Matrix Subtraction c) Matrix Multiplication

8. One needs to first input a set of N number of ALPHABETIC Strings each representing a name of a student in an array studname [N] . Assume each string can be Max. 40 Characters long. subsequently, one needs to input Marks obtained by those students in another array marks [N] Assume that studname [I] i.e. ith student in the list of student names has obtained Marks [I] in the Marks List. You need to find out and print the Max Marks obtained by a student and also print the name of the student who has obtained this mark.

9. Implement the following searching techniques
   a) Linear Search b) Binary Search

10.a) Bubble sort is a sorting algorithm that works by repeatedly stepping through lists that need to be sorted, comparing each pair of adjacent items and swapping them if they are in the wrong order. This passing procedure is repeated until no swaps are required, indicating that the list is sorted. Bubble sort gets its name because smaller elements bubble toward the top of the list. Consider an array of size 10. It will be filled it by reading 10 integers. The final output will be sorted output in Ascending Order.

b) Insertion sort is a sorting algorithm in which the elements are transferred one at a time to the right position. Here the first element in the array is considered as sorted, even if it is an unsorted array. Then each element in the array is checked with the previous elements, resulting in a growing sorted output list. With each iteration, the sorting algorithm removes one element at a time and finds the appropriate location within the sorted array and inserts it there. The iteration continues until the whole list is sorted. First an array of size 10 will be taken. We will fill it by reading 10 integers. The final output will be sorted output in Ascending Order.

11 a) Write a C program to swap two integers using pointers. You have to write a swap function that will accept the address of two integers and swap their values

b) Write a program in C to add two numbers using pointers. You have to write the fsum () function which accepts the address of two variables and returns the sum of their values to the main function.

12. Write a C program to compute internal marks of students for five different subjects using Structures.

13. Implement the following Data Structures
   a) Stack ADT b) queue ADT c) Circular queue ADT

14. a) Write a C program to implement all string operations (string length, string copy, string compare, string concatenation and string reverse) without using standard string library functions.
    b) Write a C program for reading a string and assigning its base address to the character pointer to count characters are vowels or consonants.

15. a) Write a C program to copy the file contents from one file to another file (pass file names as Command line arguments).
    b) Write a C program to count no of lines, words and characters in a file.

Course Outcomes:

After completing this course, the students should be able to

1. Apply the concepts of control structures using C.
2. Implement the concepts of arrays and functions through C programming.
3. Develop the source code to implement the concepts of Strings, Pointers and File processing.
4. Implement sorting and searching algorithms using arrays.
5. Implement stack and queue data structures using arrays.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech II Year I Semester

Dept. of Computer Science & Technology

B. Tech. II Year I Semester

18HUM102 PRINCIPLES OF MANAGEMENT

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description: The course provides students with a practical and concrete explanation of management concepts and techniques they will need to manage today's and tomorrow's organizations. The course will follow the "planning, organizing, leading, controlling" format of managerial functions while putting together many small pictures presented by individual modules into one bigger meaningful picture in which managerial knowledge would apply. At the end of the course students are expected to understand role of components of bigger picture and interactions between and among components.

Course Objectives:

The course is intended to:

1. Describe the concepts of Management theories, approaches and their application with organizations around us;
2. Know the concepts of planning and management;
3. Explain the basic concepts of organization, types and structure of organization;
4. Make the students know leading, good communication, theories of motivation; and
5. Explain about controlling, managing operations and functional areas of marketing and financial management.

UNIT I: INTRODUCTION:

Introduction to Management and Organizations- Management definition, skills, roles, goals and functions of a manager, organization, value of studying management - Managing in a Global Environment- Global Perspective, Understanding global environment, - Social Responsibility and Managerial Ethics. **(9)**

UNIT II: PLANNING

Decision-making process, Types of decisions and decision making conditions, styles, biases and errors, Planning: Meaning of planning, establishing goals and developing plans, contemporary issues in planning - Strategic Management-Importance of strategic management, strategic management process, types of organizational strategies, current issues in strategic management. **(9)**

UNIT III: ORGANIZING:

Organizational structures - HRM process, Contemporary issues in HRM – Departmentation – decentralization – delegation of Authority - Managing Change and Innovations. **(9)**

UNIT IV: COMMUNICATION, MOTIVATION AND LEADING

Functions of communication, Inter-personal communication, Barriers of Communication – Understanding Information Technology- Motivation**:** Theories of motivation and current issues in motivation. Leading: Leaders and Leadership, Leadership theories - Leadership issues in twenty first century **(9)**

UNIT V: CONTROLLING

Process of control – Types of Control - feed-forward, concurrent and feedback controls, contemporary issues in control – Strategic role of Operations Management - Value Chain Management **(9)**

Course Outcomes:

At the end of the course, students will be able to:

1. Understand the various concepts, approaches and theories of management in the real situation.
2. Analyze the concept of planning and apply on the decisions in strategic management.
3. Compare organization structure designs and chart diligently with theoretical learning concepts.
4. Apply communication and theories of motivation in an organization.
5. Understand various tools for controlling organizational performance and apply to achieve the corporate objectives.

Text Book:

1. Stephen P. Robbins, Mary Coulter "Management", Pearson Education, 2010, 10th edition.

References:

1. Gary Dessler, "Management", Prentice Hall, Inc., 1998, 1st edition.
2. Daft Richard L. 'Management' Thomson South Western, 5th edition.
3. Koontz H. and Weihrich H., "Essentials of Management", McGraw Hill Int. ed., 2004, 6th edition.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

B. Tech. II Year I Semester

18MAT111 PROBABILITY MODELS AND STATISTICS

L	T	P	C
3	1	0	4

Course prerequisite: 18MAT101

Course description:
Probability, conditional probability, Bayes theorem, random variables, mathematical expectation, discrete and continuous distributions, joint distributions, Markov chains, Poisson process; queuing models, data analysis and testing of hypothesis.

Course objectives:

1. Introduce the probability concepts through sets, random variables and univariate probability distributions.
2. Study the joint probability distributions and introduce stochastic processes.
3. Understand the idea of Markov chains and Poisson process.
4. Analyze the queuing systems and data methods.
5. Apply statistical inference involving confidence intervals and hypothesis testing in engineering problems.

UNIT I: PROBABILITY AND RANDOM VARIABLES

Introduction to probability theory, discrete random variables, continuous random variables and expectation of a random variable. **(12)**

UNIT II: JOINT DISTRIBUTIONS AND STOCHASTIC PROCESSES

Jointly distributed random variables, moment generating functions, conditional probability and conditional expectation. Introduction to stochastic processes. **(12)**

UNIT III: MARKOV CHAINS AND POISSON PROCESS

Introduction to Markov chains, Chapman–Kolmogorov equations, classification of states, limiting probabilities, the Gambler ruin problem. Definition of the Poisson process, inter-arrival and waiting time distributions, properties of Poisson process. **(12)**

UNIT IV QUEUING THEORY AND DATA ANALYSIS

Queueing theory: Introduction, preliminaries- cost equations - steady-state probabilities, exponential models - A single-server exponential queueing system–single server exponential queueing system having finite capacity -birth and death queueing models -A shoe shine shop -A queueing system with bulk service. Moments, skewness, kurtosis, correlation and linear regression. **(12)**

UNIT V: TESTS OF HYPOTHESIS

Sampling distribution, tests of significance: Null and alternative hypothesis, errors in sampling, critical region and level of significance. Test of significance for large samples-single and difference of proportions, single and difference of means. Small sample tests: *t*- test for single mean, paired and difference of means, chi-square test for goodness of fit and test for ratio of variances. **(12)**

Text Books

1. S.M. Ross, Introduction to Probability Models, 10^{th} edition, Academic press.
2. B.S. Grewal, Higher Engineering Mathematics, 43^{rd} edition (2014), Khanna publishers.

Reference Books

1. A M Yagolam, I.M. Yagolam Probability and Information, Hindustan Pub. Corp (1983)
2. J. Jacob, P. Protter, Probability Essentials, Springer Verlag, 2^{nd}edition (2013)
3. Blake, An Introduction to Applied Probability, John Wiley (2011)

Course outcomes:

After taking this course, the students should be able to

1. Understand the concepts of probability, univariate distributions and their importance.
2. Solve the joint distributions and stochastic processes evolving in time or space processes.
3. Avail the knowledge of Markov chains and Poisson process for analysis of random graphs.
4. Analyze the queuing systems and data.
5. Apply hypothesis testing to make decision in practical engineering problems.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

.

Dept. of Computer Science & Technology

B. Tech. II Year I Semester

18CST101 DATA STRUCTURES

Course Prerequisite: 18CSE102

L	T	P	C
3	0	0	3

Course Description:
This course is aimed to provide basic understanding of different data structures and algorithms. This Course covers introduction to algorithms, basic data structures like linked lists, stacks, queues, various types of trees, graphs and their implementation.

Course Objectives:
1. To develop skills to design and analyze linear and nonlinear data structures.
2. Develop algorithms for manipulating linked lists, stacks, queues, trees and graphs.
3. Develop recursive algorithms as they apply to trees and graphs.

UNIT I: LIST AND STACK
Introduction: Algorithm specification, growth of functions, Asymptotic notations.
List: Singly Linked List and Its Operations, Doubly Linked List and its operations, Circular Lists.
Stack: Array representations, operations on stack. Applications of Stack. **(9)**

UNIT II: QUEUE
Queue: array and linked list representations, operations on queue, applications of queue, Circular queue, insertion and deletion, Dequeue. Priority queue: Definition and Applications, implementation using Heaps, Max Heap, Min Heap, Insertion into a Max Heap, Deletion from a Max Heap, Heap Sort. **(9)**

UNIT III: SORTING & HASHING
Sorting: Selection Sort, Merge Sort, Quick Sort, Radix Sort
Hashing: Dictionaries, HashTable Representation, Static and Dynamic Hashing, Collision Resolution methods-Open Addressing, Separate Chaining, Double hashing. **(9)**

UNIT IV: TREE
Tree: Introduction, Terminology, Binary Tree, representation, Binary Tree Traversals. **Binary Search Tree:** Properties, Insertion, Deletion, and Searching operations. **(9)**

UNIT V: BALANCE SEARCH TREES AND GRAPHS
Balanced Search Trees: AVL Trees, Red Black Trees, and Splay Trees. **Graphs:** Terminology, Representation, operations, Graph Traversal techniques. **(9)**

Course Outcomes:
At the end of the course, students will be able to:
1. Demonstrate stacks with its applications and types of Linked lists.
2. Articulate Queue using Arrays and Linked lists
3. Illustrate Hashing and various Sorting techniques
4. Describe Tree traversal techniques and its operations.
5. Analyze Balanced Binary search trees and Graphs

Text Books:

1. Data Structures and Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffery D.Ulman.Pearson; 1st edition.
2. Data Structures and Algorithms Made Easy, Narasimha Karumanchi, CareerMonk Publications; 5th edition.

References:

1. Robert L. Kruse, Alexander J. Ryba, Data Structures and Program Design in C++, Prentice Hall, 2ed.
2. Fundamentals of Data Structures using C++, Ellis Horowitz, Sartaj Sahni, Dinesh Mehta,
3. Silicon Press, Second Edition. 2007.
4. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.
5. Data Structures, Algorithms and Applications in C++ by Sartaj Sahni, McGraw Hill, NY, Second Edition.
6. URL: http://nptel.ac.in/courses/106102064/
7. URL: https://swayam.gov.in/nd2_cec19_cs04
8. URL: https://swayam.gov.in/nd1_noc19_cs40

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

B. Tech. II Year I Semester

18CST102 OBJECT ORIENTED PROGRAMMING USING JAVA

	L	T	P	C
Course Prerequisite: 18CSE101, 18CSE102	**3**	**0**	**0**	**3**

Course Description:

Basics of Object Oriented Programming - objects, classes, polymorphism, inheritance, static and dynamic binding. Object Oriented Programming using Java-classes, interfaces, inheritance, polymorphism, method dispatch, features for encapsulation and modularity.

Course Objectives:

1. Understand object oriented programming concepts, and apply them in solving problems.
2. Learn the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes
3. To Introduce the implementation of packages and interfaces
4. Learn the concepts of exception handling and multithreading.
5. Learn the design of Graphical User Interface using applets and swing controls.

UNIT I: INTRODUCTION TO OOPS CONCEPTS AND CLASSES

Introduction to Object Oriented Programming, Java buzzwords, Java Programming Basics, Sample programs, Data types and operators, Control statements. **Classes:** Classes, Objects, Methods, Constructors, this and static keywords, Method and Constructor Overloading, Access modifiers, Polymorphism **Arrays:** One Dimensional and multi dimensional arrays. **(9)**

UNIT II: STRINGS, INHERITANCE, INTERFACES, AND PACKAGES

Strings: Strings, String Handling **Inheritance**: Basics, Usage of Super, Multi level hierarchy, Method overriding, Abstract class, Final keyword. **Packages:** Defining, Finding and Importing packages, Member Access. **Interfaces:** Creating, Implementing, Using, Extending, and Nesting of interfaces. **(9)**

UNIT III: EXCEPTION HANDLING &MULTI-THREADING

Exception Handling: Fundamentals, Types, Multiple catch clauses, Nested try blocks, Thrown Class, Using Finally and Throws, Built-in exceptions, User-defined exceptions. **Multi-threading:** Thread Class, Runnable interface, creating multiple threads, life cycle of thread, thread properties, synchronization, thread communication, suspending, resuming and stopping threads. **(9)**

UNIT IV: I/O STREAMS AND COLLECTION FRAME WORK CLASSES

I/O Streams: Byte Stream Classes and Character Stream Classes. **Collection Frame work:** Hierarchy of collection framework, ArrayList, LinkedList, Vector, Stack, Queue, Priority Queue, HashSet, LinkedHashSet, TreeSet. **(9)**

UNIT V: SWINGS

Swing – Introduction, limitations of AWT, MVC architecture, components, containers, Event Handling- Handling mouse and keyboard events, Exploring Swing- JApplet, JFrame and J Component, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables. **(9)**

Dept. of Computer Science & Technology

Course Outcomes:
At the end of the course, students will be able to

1. Understand object-oriented programming concepts for problem solving.
2. Construct class hierarchy and packages to address real-world problems.
3. Develop thread safe Java programs with appropriate Exception handling.
4. Develop Java program with file storage and collections for memory storage.
5. Construct dynamic and user-friendly graphical user interfaces for Java applications.

Text Books:

1. Java The Complete Reference, Herbert Schildt, MC GRAW HILL Education, 9^{th} Edition, 2016.

References:

1. "Programming with Java" T.V.Suresh Kumar, B.Eswara Reddy, P.Raghavan Pearson Edition.
2. "Java Fundamentals - A Comprehensive Introduction", Herbert Schildt and Dale Skrien, Special Indian Edition, McGrawHill, 2013.
3. "Java – How to Program", Paul Deitel, Harvey Deitel, PHI.
4. "Core Java", NageswarRao, Wiley Publishers.
5. "Thinking in Java", Bruce Eckel, Pearson Education.
6. Java and Object Orientation, an introduction, John Hunt, second edition, Springer.
7. "A Programmers Guide to Java SCJP", Third Edition, Mughal, Rasmussen, Pearson.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

B. Tech. II Year I Semester

18CST103 DATABASE MANAGEMENT SYSTEMS

Course Prerequisite: None

L	T	P	C
3	0	0	3

Course Description:

This course is designed to provide basic understanding on database systems and its design. The course material further used for developing any web based applications in which database is back end. Course covers from all basic and advanced queries of SQL, PL/SQL programs, Relational algebra and calculus, normal forms, low level details such as representing data elements of database and indexed structures, transaction management and data recovery.

Course Objectives:

1. To understand the components of DBMS and to study the database design.
2. To study the retrieval of data using relational algebra and calculus and the concept of normal forms in the design of database.
3. To comprehend the structure of SQL Queries to query, update, and manage a database.
4. To understand all constraints to develop a business application using cursors, triggers and stored procedures.
5. To provide knowledge on distributed databases, concurrency techniques.

UNIT I: DATABASE SYSTEM ARCHITECTURE AND RELATIONAL MODEL

Overview of Database Systems: Managing data, File Systems versus a DBMS,

Introduction to Database Design: Database design and ER Diagrams, Entities, Attributes and Entity sets, Relationships and relationship types, Additional features of ER model, conceptual design with the ER Model. **Introduction to Relational Model**: Introduction, Integrity Constraints, Logical database design, Introduction to views. **Relational Algebra**: Preliminaries, Relational algebra- Selection and Projection, Set Operations, Renaming, Joins, Division **(9)**

UNIT II: RELATIONAL CALCULUS AND SQL

.Relational Calculus – Expressive power of Algebra and Calculus.
The Database Language SQL – Simple Queries in SQL – Queries Involving More than One Relation, Sub Queries, aggregate operators, null values, complex integrity constraints, triggers and active databases Embedded SQL, Dynamic SQL, Cursors, Introduction to JDBC, Stored Procedures. **(9)**

UNIT III: DATABASE DESIGN

Functional Dependencies– Rules about Functional Dependencies, Keys, Design of Relational Database Schemas, Multivalued Dependencies. **(9)**

UNIT IV: STORAGE STRATEGIES AND TRANSACTION PROCESSING

Storage strategies: Indices, B-trees, hashing. **Transaction Processing:**Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes. **(9)**

UNIT V: DATABASE SECURITY

Database recovery Authentication, Authorization and access control, DAC, MAC and RBAC models, SQL injection. **(9)**

Course Outcomes:

At the end of the course, students will able to

1. Understand the conceptual design to draw ER diagrams.
2. Construct relational calculus for expressive database queries and utilize SQL to formulate complex queries.
3. Apply Functional Dependencies and normalization in Database Design.
4. Interpret transaction processing techniques and storage strategies in database.
5. Implement security measures for database.

Text Books:

1. Database Management Systems, Raghu RamaKrishnan, Johannes Gehrke, 3rd Edition, 2003, McGraw Hill.
2. Database Systems, The Complete Book, Hector Garcia-Molina, Jeffrey D. Ullman and Jennifer Widom, 3rd impression, 2009, Pearson.

References:

1. "Data base System Concepts", Silberschatz, Korth, McGraw Hill, V edition
2. "Fundamentals of Database Systems", Elmasri Navathe, 6th edition, 2013, Pearson.
3. "Introduction to Database Systems", C. J. Date, Pearson Education.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

B. Tech. II Year I Semester

18CST201 DATA STRUCTURES LABORATORY

Course Prerequisite: 18CSE102, 18CSE201

L	T	P	C
0	0	3	1.5

Course Description:
This course is aimed to provide hands on experience to implement basic linear and nonlinear data structures. This course covers implementation of stack, queue, list, sorting techniques, binary search trees, and balanced search trees.

Course Objectives:
1. To develop skills to analyze and program linear and nonlinear data structures.
2. Develop different data structures with effective usage of arrays and linked lists.
3. Develop recursive algorithms as they apply to trees and graphs.

List of Experiments

1. Write a Program to Implement Singly Linked List and its operations.
2. a) Write a Program to Implement Stack Operations by using Array.
   b) Write a Program to Implement Stack Operations by using Linked List.
3. a) Write a program that uses stack operations to convert a given infix expression into its postfix.
   b) Write a program that uses stack operations to evaluate given postfix expression.
4. a) Write a Program to implement the operations of Queue using array.
   b) Write a Program to implement the operations of Queue using linked list.
5. Write a Program to Implement Circular Queue Operations by using Array.
6. Write a Program to Sort the set of elements by using
   i) Quick Sort.   iii) Merge Sort.
7. Write a Program to Implement All functions of a Dictionary by using Hashing.
8. Write a Program to Implement the Binary Search Tree Operations.
9. Write a Program to Perform the Tree Traversal Techniques by using Iterative Method
10. Write a Program to Perform the Tree Traversal Techniques by using recursion.
11. Write a program to Implement Insertion and Deletion Operations on AVL Trees
12. Write a program for implementing the following graph traversal algorithms:
    a) Depth First Search   b) Breadth First Search.

Course Outcomes:
At the end of the course the student will be able to
1. Experiment the working principles of arrays and linked lists
2. Implement stack and queue using array and linked lists
3. Implement quick sort and merge sort algorithms using arrays
4. Evaluate the working strategies of binary and AVL trees
5. Implement DFS and BFS techniques on graphs

References:

1. Data Structures and Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffery D.Ulman.Pearson; 1st edition.
2. Data Structures and Algorithms Made Easy, Narasimha Karumanchi, CareerMonk Publications; 5th edition.
3. Robert L. Kruse, Alexander J. Ryba, Data Structures and Program Design in C++, Prentice Hall, 2ed.
4. Fundamentals of Data Structures using C++, Ellis Horowitz, Sartaj Sahni, Dinesh Mehta,Silicon Press, Second Edition. 2007.
5. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.
6. Data Structures, Algorithms and Applications in C++ by Sartaj Sahni, McGraw Hill, NY, Second Edition.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Dept. of Computer Science & Technology

B. Tech. II Year I Semester

18CST202 OBJECT ORIENTED PROGRAMMING USING JAVA LABORATORY

Course Prerequisite: 18CSE102

L	T	P	C
0	0	3	1.5

Course Description:
Basics of Object Oriented Programming - objects, classes, polymorphism, inheritance, static and dynamic binding. Object Oriented Programming using Java-classes, interfaces, inheritance, polymorphism, method dispatch, features for encapsulation and modularity.

Course Objectives:
1. Understand object oriented programming concepts, and apply them in solving problems.
2. Learn the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes
3. To Introduce the implementation of packages and interfaces
4. Learn the concepts of exception handling and multithreading.
5. Learn the design of Graphical User Interface using applets and swing controls.

LIST OF EXPERIMENTS:

1. a) Write a Java program that prints all real solutions to the quadratic equation $ax^2 + bx + c = 0$. Read in a, b, c and use the quadratic formula. If the discriminant b2-4ac is negative, display a message stating that there are no real solutions.
   b) Write a Java program that find prime numbers between 1 to n.
   c) Write a Java Program that find the factorial of a number

2. a) The Fibonacci sequence is defined by the following rule: The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a Java program that print the nth value in the Fibonacci sequence.
   b) Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a Palindrome.
   c) Write a Java program for sorting a given list of names in ascending order.

3. a) Write a java program to split a given text file into n parts. Name each part as the name of the original file followed by part<n> where n is the sequence number of the part file
   b) Write a java program to convert an ArrayList to an Array.
   c) Write a Java program to make frequency count of vowels, consonants, special symbols, digits, words in a given text.

4. a) Write a Java program that reads a file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
   b) Write a Java program that reads a file and displays the file on the screen, with a line number before each line.
   c) Implement Stack using queues.

5. a) Write a java program to make rolling a pair of dice 10,000 times and counts the number of times doubles of are rolled for each different pair of doubles. Hint: Math.random()
   b) Write java program that inputs 5 numbers, each between 10 and 100 inclusive. As each number is read display it only if it is not a duplicate of any number already read display the complete set of unique values input after the user enters each new value.

c) Write a java program to read the time intervals (HH:MM) and to compare system time if the system time between your time intervals print correct time and exit else try again to repute the same thing. By using StringToknizer class.

6. a) Write java program to create a super class called Figure that receives the dimensions of two dimensional objects. It also defines a method called area that computes the area of an object. The program derives two subclasses from Figure. The first is Rectangle and second is Triangle. Each of the sub class overridden area() so that it returns the area of a rectangle and a triangle respectively.

   b) Write a Java program that creates three threads. First thread displays ―Good Morning‖ every one second, the second thread displays ―Hello‖ every two seconds and the third thread displays ―Welcome‖ every three seconds

7. a) Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.

   b) Use inheritance to create an exception super class called EexceptionA and exception sub class ExceptionB and ExceptionC, where ExceptionB inherits from ExceptionA and ExceptionC inherits from ExceptionB. Write a java program to demonstrate that the catch block for type ExceptionA catches exception of type ExceptionB and ExceptionC

8. Write a Java Program to design login window using AWT components.

9. Develop an application for simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result

10. Design & Develop an application that creates a user interface to perform integer divisions. The user enters two numbers in the JtextFields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a NumberFormatException. If Num2 were Zero, the program would throw an ArithmeticException Display the exception in a message dialog box.

11. Design a GUI application that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time No light is on when the program starts.

12. Design a GUI application for Cafeteria bill generation.

Project Based Learning:
Design and development a Mini project using OOPs concepts.

Course Outcomes
At the end of the course, students will be able to
1. Apply the concepts of control structures using Java.
2. Develop operations on strings and files using java libraries.
3. Apply exception handling for making robust JAVA code.
4. Develop thread based program with synchronization.
5. Select the appropriate Swing container and component for GUI Design.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Dept. of Computer Science & Technology

B. Tech. II Year I Semester

18CST203 DATABASE MANAGEMENT SYSTEMS LABORATORY

Course Prerequisite: None

L	T	P	C
0	0	3	1.5

Course Description:

This course is designed to provide basic understanding on database systems and its design. The course material further used for developing any web based applications in which database is back end. Course covers from all basic and advanced queries of SQL, PL/SQL programs, Relational algebra and calculus, normal forms, low level details such as representing data elements of database and indexed structures, transaction management and data recovery.

Course Objectives:

1. To understand the components of DBMS and to study the database design.
2. To study the retrieval of data using relational algebra and calculus and the concept of normal forms in the design of database.
3. To comprehend the structure of SQL Queries to query, update, and manage a database.
4. To understand all constraints to develop a business application using cursors, triggers and stored procedures.
5. To provide knowledge on distributed databases, concurrency techniques.

LIST OF EXPERIMENTS

1. To study DDL-create and DML-insert commands.
   a) Create tables according to the following definition.
   b) Insert the data as shown below.
   c) From the above given tables perform the following queries:

   (1) Describe deposit, branch.
   (2) Describe borrow, customers.
   (3) List all data from table DEPOSIT.
   (4) List all data from table BORROW.
   (5) List all data from table CUSTOMERS.
   (6) List all data from table BRANCH.
   (7) Give account no and amount of depositors.
   (8) Give name of depositors having amount greater than 4000.
   (9) Give name of customers who opened account after date '1-12-96'.

2. Create the below given table and insert the data accordingly.

   Perform following queries
   (1) Retrieve all data from employee, jobs and deposit.
   (2) Give details of account no. and deposited rupees of customers having account opened between dates 01-01-06 and 25-07-06.
   (3) Display all jobs with minimum salary is greater than 4000.
   (4) Display name and salary of employee whose department no is 20. Give alias name to name of employee.
   (5) Display employee no, name and department details of those employee whose department lies in(10,20)

To study various options of LIKE predicate

(1) Display all employee whose name start with ‘A’ and third character is ‘ ‘a’.
(2) Display name, number and salary of those employees whose name is 5 characters long and first three characters are ‘Ani’.
(3) Display the non-null values of employees and also employee name second character should be ‘n’ and string should be 5 character long.
(4) Display the null values of employee and also employee name’s third character should be ‘a’.
(5) What will be output if you are giving LIKE predicate as ‘%_%’ ESCAPE ‘\’

3. To Perform various data manipulation commands, aggregate functions and sorting concept on all created tables.

(1) List total deposit from deposit.
(2) List total loan from karolbagh branch
(3) Give maximum loan from branch vrce.
(4) Count total number of customers
(5) Count total number of customer’s cities.
(6) Create table supplier from employee with all the columns.
(7) Create table sup1 from employee with first two columns.
(8) Create table sup2 from employee with no data
(9) Insert the data into sup2 from employee whose second character should be ‘n’ and string should be 5 characters long in employee name field.
(10) Delete all the rows from sup1.
(11) Delete the detail of supplier whose sup_no is 103.
(12) Rename the table sup2.
(13) Destroy table sup1 with all the data.
(14) Update the value dept_no to 10 where second character of emp. name is ‘m’.
(15) Update the value of employee name whose employee number is 103.

4. To study Single-row functions.

(1) Write a query to display the current date.
(2) For each employee, display the employee number, job, salary, and salary increased by 15% and expressed as a whole number. Label the column New Salary
(3) Modify your query no 4.(2) to add a column that subtracts the old salary from the new salary. Label the column Increase
(4) Write a query that displays the employee’s names with the first letter capitalized and all other letters lowercase, and the length of the names, for all employees whose name starts with J, A, or M. Give each column an appropriate label. Sort the results by the employees’ last names.
(5) Write a query that produces the following for each employee: <employee last name> earns <salary> monthly
(6) Display the name, hire date, number of months employed and day of the week starting with Monday.
(7) Display the hiredate of emp in a format that appears as Seventh of June 1994 12:00:00 AM.
(8) Write a query to calculate the annual compensation of all employees (sal+comm)

5. Displaying data from Multiple Tables (join)

    (1) Give details of customers ANIL.
    (2) Give name of customer who are borrowers and depositors and having living city Nagpur
    (3) Give city as their city name of customers having same living branch.
    (4) Write a query to display the last name, department number, and department name for all employees.
    (5) Create a unique listing of all jobs that are in department 30. Include the location of the department in the output
    (6) Write a query to display the employee name, department number, and department name for all employees who work in NEW YORK.
    (7) Display the employee last name and employee number along with their manager's last name and manager number. Label the columns Employee, Emp#, Manager, and Mgr#, respectively.
    (8) Create a query to display the name and hire date of any employee hired after employee SCOTT.

6. To apply the concept of Aggregating Data using Group functions.

    (1) List total deposit of customer having account date after 1-jan-96.
    (2) List total deposit of customers living in city Nagpur.
    (3) List maximum deposit of customers living in bombay.
    (4) Display the highest, lowest, sum, and average salary of all employees. Label the columns Maximum, Minimum, Sum, and Average, respectively. Round your results to the nearest whole number.
    (5) Write a query that displays the difference between the highest and lowest salaries. Label the column DIFFERENCE.
    (6) Create a query that will display the total number of employees and, of that total, the number of employees hired in 1995, 1996, 1997, and 1998
    (7) Find the average salaries for each department without displaying the respective department numbers.
    (8) Write a query to display the total salary being paid to each job title, within each department.
    (9) Find the average salaries > 2000 for each department without displaying the respective department numbers.
    (10) Display the job and total salary for each job with a total salary amount exceeding 3000, in which excludes president and sorts the list by the total salary.
    (11) List the branches having sum of deposit more than 5000 and located in city bombay.

7. To solve queries using the concept of sub query.

    (1) Write a query to display the last name and hire date of any employee in the same department as SCOTT. Exclude SCOTT
    (2) Give name of customers who are depositors having same branch city of mr. sunil.
    (3) Give deposit details and loan details of customer in same city where pramod is living.
    (4) Create a query to display the employee numbers and last names of all employees

who earn more than the average salary. Sort the results in ascending order of salary.
(5) Give names of depositors having same living city as mr. anil and having deposit amount greater than 2000
(6) Display the last name and salary of every employee who reports to ford.
(7) Display the department number, name, and job for every employee in the Accounting department.
(8) List the name of branch having highest number of depositors.
(9) Give the name of cities where in which the maximum numbers of branches are located.
(10) Give name of customers living in same city where maximum depositors are located.

8. Manipulating Data
   (1) Give 10% interest to all depositors.
   (2) Give 10% interest to all depositors having branch vrce
   (3) Give 10% interest to all depositors living in nagpur and having branch city bombay.
   (4) Write a query which changes the department number of all employees with empno 7788's job to employee 7844'current department number.
   (5) Transfer 10 Rs from account of anil to sunil if both are having same branch.
   (6) Give 100 Rs more to all depositors if they are maximum depositors in their respective branch.
   (7) Delete depositors of branches having number of customers between 1 to 3.
   (8) Delete deposit of vijay.
   (9) Delete borrower of branches having average loan less than 1000.
9. **a)** Create a cursor to update the salary of employees in EMP table .

   b) Write a PL/SQL program to raise an Exception when the bonus exceeds salary

10. a) Create a trigger which checks whether employee with Emp_no is present in the Employee table before inserting into EMP.
    b) Write a procedure to insert a record into ORDER table by validating qty limit of the item and also check whether that item exists

Project Based Learning:

Design and implementation of Student Information System

Course Outcomes:
At the end of the course the student will be able to
1. Demonstrate DDL and DML operations on database tables.
2. Practice complex queries to access the data using SQL join.
3. solve queries using the concept of sub query.
4. Implement stored procedures for database.
5. Apply exceptions and triggers to database.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech II Year II Semester

Dept. of Computer Science & Technology

B.Tech. II Year II Semester

18HUM101 ECONOMICS AND FINANCIAL ACCOUNTING FOR ENGINEERS

Course Prerequisite: None

L	T	P	C
3	0	0	3

Course Description: The Engineering Economics and Financial Accounting aims to provide an insight into production, cost analysis, market structure, Accounting Basic concepts and financial Statement Analysis. The course is designed to give emphasis on the application of real life examples on various fundamental issues of economics and accounts. This course introduces the accounting system, principles, types of accounts, and financial statements etc. The ratio analysis and financial analysis are useful to know the position of financial statements. Funds flows statements and cash flow statements are explained to know the analysis of financial matters.

Course Objectives: The course is intended to:
1. Describe the nature of engineering economics in dealing with the issues of scarcity;
2. Know the supply, demand, production and cost analysis to analyze the impact of economic events on markets;
3. Explain the performance of firms under different market structures and Price determination in various market conditions.
4. Explain the accounting principles, types of accounting and preparation of final accounts; and
5. Describe the financial analysis through ratios, funds flow and cash flow statements.

UNIT I: DEMAND ANALYSIS:
Scope and Significance of Economics- Understanding the problem of scarcity and choice - Elements of market Economy: Demand, Supply and Market Equilibrium- Theory of Demand, Elasticity of Demand, Supply and Law of Supply. **(9)**

UNIT II: PRODUCTION AND COST ANALYSIS
Production Function – Short-run and long- run production – Cost Analysis: Cost concepts - Cost Structure of Firms and output decision- Break-Even Analysis (BEA) – Managerial significance and limitations of BEA - Determination of Break Even Point (Simple Problems). **(9)**

UNIT III: MARKET STRUCTURE:
Classification of Markets - General Equilibrium and efficiency of Perfect competition, Monopoly, Monopolistic, Oligopoly, Duopoly – Price determination and various market conditions. **(9)**

UNIT IV: BASICS OF ACCOUNTING:
Uses of Accounting - Book Keeping Vs Accounting - Double Entry System - Accounting Principles - Classification of Accounts - Rules Of Debit & Credit. Accounting Cycle: Journal, Ledger, Trial Balance. Final Accounts: Trading Account - Profit & Loss Account - Balance Sheet with Adjustments, (Simple Problems). **(9)**

UNIT V: BASICS OF FINANCIAL ANALYSIS

Ratio Analysis - Liquidity, Leverage, Solvency and Profitability Ratios - Interpretation of Financial Statements - FundS Flow Statement - Capital Budgeting **(9)**

Course Outcomes:

At the end of the course, students will be able to:

1. Understand Engineering economics basic concepts,
2. Analyze the concepts of demand, elasticity, supply, Production, Cost Analysis and its essence in floating of an organization,
3. Compare different market structures and identify suitable market,
4. Demonstrate an understanding and analyzing the accounting statements, and
5. Demonstrate the ability to apply knowledge of accounting concepts through Financial Statements Analysis.

Textbook:

1. Case E. Karl & Ray C. Fair, "Principles of Economics", Pearson Education, 8th Edition, 2007

2. Financial Accounting, S.N.Maheshwari, Sultan Chand, 2009

3. Financial Statement Analysis, Khan and Jain, PHI, 2009

4. Financial Management, Prasanna Chandra, T.M.H, 2009

References:

1. Lipsey, R. G. & K. A. Chrystal , "Economics", Oxford University Press, 11th Edition, 2007.

2. Samuelson P. A. &Nordhaus W. D. "Economics", Tata McGraw-Hill 18th Edition, 2007

3. Financial Management and Policy, Van Horne, James,C., Pearson ,2009.

4. Financial Management, I.M.Pandey, Vikas Publications

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

.

Dept. of Computer Science & Technology

B. Tech. II Year II Semester

18MAT112 DISCRETE MATHEMATICAL STRUCTURES

L	T	P	C
3	0	0	3

Course Prerequisite: 18MAT101

Course Description:
This course introduces the concepts of discrete mathematics and their applications in computer science. It covers algebraic structures, combinatorics and finite state machines. It also provides insight into the concepts of graph theory and their applications.

Course Objectives
1. To introduce the concepts of logic, rules of inference and predicates.
2. To discuss the concepts on combinatorics.
3. To explain the concepts of algebraic structures.
4. To familiarize the principles of Lattices and Boolean algebra.
5. To illustrate the problems in graph theory.

Unit I: Mathematical Logic and Statement Calculus
Introduction -Statements and Notation - Connectives – Tautologies – Two State Devices and Statement logic - Equivalence - Implications - The Theory of Inference for the Statement Calculus –-The Predicate Calculus - Inference Theory of the Predicate Calculus.
(9)

Unit II: Combinatorics
The Basics of Counting- The Pigeonhole Principle -Permutations and Combinations - Binomial Coefficients -Generalized Permutations and Combinations –Generating Permutations and Combinations. **(9)**

Unit III: Algebraic Structures
Semigroups and Monoids - Grammars and Languages –Types of Grammars and Languages – Groups – Subgroups – Lagranges Theorem –Homomorphism: Introduction –Properties - Group Codes. **(9)**

Unit IV: Lattices and Boolean algebra
Partially Ordered Relations-Posets-Hasse Digram - Lattices - Boolean algebra - Boolean Functions - Representation and Minimization of Boolean Functions. **(9)**

Unit V: Graph Theory
Basic Concepts of Graph Theory - Matrix Representation of Graphs – Trees - Storage Representation and Manipulation of Graphs-Dijkstra's and Kruskal's algorithms -Introduction to Finite State Machines. **(9)**

Textbook

1. Discrete Mathematics and its Applications, seventh edition, Kenneth Rosen, Tata McGrawHill Education Private Limited.
2. Discrete Mathematical Structures with Applications to Computer Science J.P Tremblay, R.Manohar, TMH.

References

1. "Discrete mathematics for computer scientists and mathematicians", Mott, Kandel, Baker, PHI
2. Johnson Baugh R, and Carman R, Discrete mathematics, 6th edition, Person Education, 2003.
3. Kolman B, Busoy R.C, and Ross S.C, Discrete Mathematical Structures, Prentice Hall, 2004.

Course Outcomes

At the completion of the course the students will be able to:

1. Evaluate elementary mathematical arguments and identify fallacious reasoning (not just fallacious conclusions).
2. Understand the concepts of combinatorics.
3. Apply graph theory models of data structures and state machines to solve problems of connectivity under constraints such as scheduling.
4. Synthesize concepts of algebraic structures to represent the real system.
5. Learn elementary proofs and properties of modular arithmetical results; and explain their applications such as in cryptography and hashing algorithms.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

.

Dept. of Computer Science & Technology

B. Tech. II Year II Semester

18BIO101 LIFE SCIENCES FOR ENGINEERS

L	T	P	C
3	0	0	3

Course Prerequisites: Basic knowledge about sciences up to intermediate or equivalent level.

Course Description: The course deals with basic concepts of life sciences, its impact on human & universe, biological systems and functions, human physiology and metabolism.

Course Objectives

1. Introduce the molecular basis of life.
2. Provide the basis for classification of living organisms.
3. Describe the transfer of genetic information**.**
4. Introduce the techniques used for modification of living organisms**.**
5. Describe the applications of biomaterials

UNIT I: Introduction to Life Sciences & Living Organisms
Why we need to study Life Sciences? Comparison and differences of biological organisms with manmade systems (Eye & Camera, Bird flying & Aircraft), Biological observations of 18th Century that led to major discoveries. Classification of living organisms, Cellular basis of life, differences between prokaryotes and eukaryotes, classification on the basis of carbon and energy sources. **(8)**

UNIT II: Biomolecules & Macromolecules
Molecules of life: Water, Sugars, Starch, Cellulose, Amino acids, Structure and functions of proteins (primary, secondary, tertiary and quaternary structure), Structure and functions of nucleotides, nucleic acids, DNA (single and double strand) & RNA, hemoglobin, antibodies and enzymes, Industrial applications of enzymes and Fermentation process. **(10)**

UNIT III: Human Physiology
Bioenergetics, Respiration: Glycolysis and TCA cycle, Electron transport chain and oxidative phosphorylation, Human physiology, Neurons, Synaptic and Neuromuscular junctions. **(7)**

UNIT IV: Genes, DNA & RNA
Mendel's laws, gene mapping, Mitosis and Meiosis, single gene disorders in humans, Genetic code, DNA replication, Transcription, Translation. Discuss the concept of complementation using human genetics. Recombinant DNA Technology: recombinant vaccines, transgenic microbes, plants and animals, animal cloning, biosensors, biochips. **(10)**

UNIT V: Metabolism
Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of Keq and its relation to standard free energy. ATP as an energy currency. This should include the breakdown of glucose to CO_2 + H_2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Mechanism of Photosynthesis) **(10)**

Course Outcomes

After studying the course, the student will be able to:

1. Understand the differences between biological organisms and manmade systems and classify organisms.
2. Interpret the relationship between the structure and function of proteins, nucleic acid and summarize the industrial applications of biomolecules.
3. Discuss the mechanism of respiration
4. Demonstrate the mapping of genes and medical importance of gene disorders.
5. Apply thermodynamic and kinetic principles to biological systems.

Textbooks:

1. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2018.
2. Arthur T Johnson, Biology for Engineers, CRC press, 2011.
3. Cell and Molecular Biology by De Robetis and De Robertis.

Reference Books:

1. Alberts Et. Al. The molecular biology of the cell, 6/e, Garland Science, 2014.
2. E. E. Conn, P. K. Stumpf, G. Bruening and R. H. Doi, "Outlines of Biochemistry", John Wiley and Sons, 2009.
3. John Enderle and Joseph Bronzino Introduction to Biomedical Engineering, 3/e, 2012.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

B. Tech. II Year II Semester

18CST104 DIGITAL LOGIC DESIGN

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description: This course provides a modern introduction to logic design and the basic building blocks used in digital systems, in particular digital computers. It starts with a discussion of combinational logic, and also the course deals with sequential circuits, State machines, Different representations including truth table; logic gate, timing diagram, switch representation, and state diagram will be discussed.

Course Objectives:

1. The Objective of this course is to familiarize the student with fundamental principles of digital design.
2. Acquire the skills to manipulate and examine Boolean algebraic expressions, logical operations, Boolean functions and their simplifications.
3. Acquaint with classical hardware design for both combinational and sequential logic circuits.

UNIT I: BINARY SYSTEMS, BOOLEAN ALGEBRA AND LOGIC GATES

Binary Systems: Digital Systems, Binary Numbers, Number Base Conversions, Octal and Hexadecimal Numbers, Compliments, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, RTL. Boolean Algebra and Logic Gates: Basic Definitions, Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates, Integrated Circuits. **(9)**

UNIT II: GATE – LEVEL MINIMIZATION

The Map Method, Four Variable Map, Five-Variable Map, Product of Sums Simplification, Don’t-Care Conditions, NAND and NOR Implementation, Other Two Level Implementations, EX-OR Function, Other Minimization Methods. **(9)**

UNIT III: COMBINATIONAL LOGIC

Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Analysis of arithmetic units - Multiplication and Division algorithms, Magnitude Comparator, Decoders, Encoders, Multiplexers, Demultiplexers, HDL description. **(9)**

UNIT IV: SYNCHRONOUS SEQUENTIAL LOGIC

Sequential Circuits, Latches, Flip-Flops, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Design Procedure, Registers, Shift Registers, Ripple Counters, Synchronous Counters. **(9)**

UNIT V: MEMORY AND PROGRAMMABLE LOGIC

Memory Hierarchy & different types of memories, Random access memory, memory decoding, Error Detection and Correction, Read-only Memory, Programmable Logic Array, Programmable Array Logic, Design of Digital Systems- Algorithmic State Machines, Digital Integrated Circuits-TTL, MOS Logic families and their characteristics. **(9)**

Course Outcomes:

At the end of the course, students will be able to:

1. Understand number systems and logic gates
2. Construct logical units by using logical elements.
3. Discuss combinational circuits & analysis of arithmetic units
4. Demonstrate the procedure of synchronous sequential circuits.
5. Illustrate the memory hierarchy and programmable logic.

Textbooks:

1. Digital Design, M. Morris Mano, Micheal D. Ciletti, 5th Edition, 2013, Pearson.
2. G Raghurama, TSB Sudharshan "Introduction to Computer Organization". EDD notes 2007

References:

1. Donald D. Givonne, "Digital Principles and Design" TMH, 2003. Digital Logic & State Machine Design, David J. Comer, Oxford University Press, 3rd Reprinted Indian Edition, 2012.
2. Digital Logic Design, R.D. Sudhakar Samuel, Elsevier.
3. Computer System Architecture, M. Morris Mano, 3th Edition, pearson
4. Digital Logic Design, Leach, Malvino, Saha,TMH.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech. II Year II Semester

18CST105 DESIGN AND ANALYSIS OF ALGORITHMS

L	T	P	C
3	0	0	3

Course Prerequisite: 18CSE102**,** 18CST102

Course Description:
This course emphasis on analysis of various types of algorithms. It provides idea to design the algorithm to solve the problems using complexity analysis.

Course Objectives:
1. To introduce the concepts of Algorithm Analysis, Time Complexity, Space Complexity.
2. To discuss various Algorithm Design Strategies with proper illustrative examples.
3. To introduce Complexity Theory with NP and Linear programming.

UNIT I: INTRODUCTION & DIVIDE AND CONQUER
Introduction: Algorithm specification, growth of functions, Asymptotic notations. **Divide and Conquer:** Master Method, Binary Search, Finding the maximum and minimum, Merge sort, Quick Sort, Median finding Algorithm, Strassen's matrix multiplication. **(9)**

UNIT II: GREEDY METHOD & DYNAMIC PROGRAMMING
Greedy Method: General method, Knapsack problem, Huffman Code, Job Scheduling with Deadlines, Minimum cost Spanning Trees. **Dynamic Programming:** Fibonacci, LCS, Matrix Chain Multiplication, Stamp Problem, Knapsack problems, The traveling sales person problem. **(9)**

UNIT III: GRAPH ALGORITHMS & ADVANCED GRAPH ALGORITHMS
Graph Algorithms: BFT, DFT, topological sort, Connected components, Minimum cost Spanning Trees, Kruskal's algorithm, Prim's algorithm. **Advanced Graph Algorithms: Shortest Path Algorithm**: Single Source Shortest path Algorithm Dijkstra's, All Pairs Shortest Path Algorithm – Floyd Warshall's. **(9)**

UNIT IV: BACK TRACKING, BRANCH AND BOUND
Backtracking: Introduction, n-Queens Problem, sum of sub set problem
Branch and Bound: The method, Travelling salesperson, 0/1 Knapsack problem. **(9)**

UNIT V: NP–HARD AND NP– COMPLETE PROBLEMS
NP–Hard and NP–Complete Problems: Complexity Class - P, NP, NP Complete, NP Hard. Is P=NP?, Reducibility.
Network flow problem - Ford Fulkerson Algorithm for Maximum Flow Problem **(9)**

Course Outcomes:
1. Apply divide and conquer strategy on real world problems.
2. Identify feasible solutions for various problems through greedy method and dynamic programming.
3. Examine graph traversal Algorithms.
4. Illustrate the usage of Backtracking, Branch and Bound techniques.

5. Categorizes the NP Hard & NP Complete techniques.

Textbooks:

1. Micheal T. Goodrich and Roberto Tamassia: Algorithm Design: Foundations, Analysis and Internet examples (Algorithms, MIT Press, Second Edition)
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran. Fundamentals of Computer Algorithms, MIT Press, Second Edition (Prentice Hall)

References:

1. Cormen T.H., Leiserson, C.E., Rivest, R.L., and C. Stein. Introduction to Algorithms, MIT Press, Second Edition.
2. Jon Kleinberg and Eva Tardos. Algorithm Design. Pearson Education. (2007)
3. Sanjoy Das Gupta, Christos Papadimitriou, Umesh Vazirani, Algorithms Tata McGraw-Hill Publishers
4. Alfred V. Aho, John E. Hopcroft, Jeffery D.Ulman. Data Structures and Algorithms

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

B. Tech. II Year II Semester

18CST106 OPERATING SYSTEMS

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description:
This course will cover the tradeoffs that can be made between performance and functionality during the design and implementation of an operating system. Particular emphasis will be given to three major OS subsystems: process management (processes, threads, CPU scheduling, synchronization, and deadlock), memory management (segmentation, paging, swapping), and file systems.

Course Objectives:
1. To learn the mechanisms of OS to handle processes and threads and their communication
2. To give introduction to shell programming.
3. To learn the mechanisms involved in memory management in contemporary OS
4. To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
5. To know the components and management aspects of concurrency management

UNIT I: INTRODUCTION
Concept of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Case study on UNIX and WINDOWS Operating System.
KORN SHELL PROGRAMMING: Basic Script Concepts, Expressions, Decisions: Making Selections, Repetition, Special Parameters and Variables, Changing Positional Parameters, Argument Validation, Debugging Scripts. **(9)**

UNIT II: PROCESS CONCEPTS
Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads, Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling. **(9)**

UNIT III: PROCESS SYNCHRONIZATION AND DEADLOCKS
Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc. Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery. **(9)**

UNIT IV: MEMORY MANAGEMENT STRATEGIES
Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition– Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware

support for paging, Protection and sharing, Disadvantages of paging. Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU) **(9)**

UNIT V: FILE SYSTEM

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance. Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks. **(9)**

Course Outcomes:

At the completion of the course the students will be able to

1. Discuss the structure and functions of OS.
2. Interpret the process of scheduling techniques.
3. Understand the concurrent processess and deadlock situations.
4. Atriculate the strategies of memory management .
5. Demonstrate file and disk management techniques.

Textbooks:

1. Operating System Concepts Essentials, 9th Edition by Avi Silberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.

References:

1. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
2. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
3. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
4. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

.

B. Tech. II Year II Semester

18ENG201 ENGLISH COMMUNICATION – LISTENING & SPEAKING LABORATORY
(Common to all branches)

L	T	P	C
0	0	2	1

Course Prerequisite: 18ENG101

Course Description: As the **s**tudents are being exposed to the global language 'English; it has become a widespread need. This course builds on what was offered in the first semester and facilitates deeper understanding into the mechanics of the English language, especially in regard to two particular skills, i.e. Listening and Speaking. This course is offered in order to help students cultivate and nurture a mind that "thinks in English." Intricate issues of pronunciation, modulation, timbre are dealt with in regard to Speaking and also the sub-skills of Listening, thus the whole course is entirely lab oriented.

Course Objectives: This course enables students to
1. Hone in on their listening skills
2. Grasp the differences between native level and mother-tongue influenced pronunciation
3. Develop crucial speaking skills
4. Enhance vocabulary for greater communicative impact
5. Overall development of thinking in the English language

UNIT 1: Listening; Understanding key vocabulary; Listening for main ideas; Listening in detail; Syllable stress; Sentence stress; Presentation. **(12)**

UNIT 2: Vocabulary for important places (bank, library, restaurant, etc.); Prepositions for places; Stress determiners (this & that); Intonation. **(12)**

UNIT 3: Using background knowledge; Collocations; Pronouncing clusters of consonants (e.g. –gh, -ing, ph, ck); Mapping ideas; Pronunciation of phrases; Listening for opinion; Vocabulary and collocations for jobs **(12)**

UNIT 4: Listening for lecture organization; Text organization features; Phrases with make; Evaluating and proposing ideas; Expressing attitudes **(12)**

UNIT 5: Identifying opposing viewpoints; Silent letters; Idioms; Fixed expressions; Phrasal verbs **(12)**

Course Outcomes:
At the end of the course, learners will be able to:
1. Listening with intent
2. Pronounce more fluently
3. Develop crucial thinking skills
4. Enhance vocabulary
5. Overall development in the English language

Suggested Reading/Textbook:
1. Sabina Ostrowska; *Unlock 3 series(B1): Listening & Speaking*; Published by: Cambridge University Press.

Reference:

1. Gary Buck; *Assessing Listening;* Cambridge University Press, 2010.
2. Adrian Doff, Craig Thaine, Herbert Puchta, et al; *Empower: Upper Intermediate (B2+)*; Published by: Cambridge University Press.
3. Josh Sreedharan; *The Four Skills for Communication;* Cambridge University Press, 2014.
4. William Strunk Jr; *The Elements of Style*; ITHACA, N.Y.; W.P. HUMPHREY, 2006.
5. Joseph Devlin; *How to Speak and Write Correctly*; ITHACA, N.Y.; W.P. HUMPHREY, 2006.
6. Miles Carven; *Listening Extra*; Cambridge University Press, 2008.
7. Jayashree Mohanraj; *Speak Well*; Orient Blackswan, 2013.
8. F. Kipple; *Keep Talking*; Cambridge University Press, 2013.
9. www.cambridgeenglish.org/in/
10. https://learnenglish.britishcouncil.org/en/english-grammar
11. https://www.rong-chang.com/

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Dept. of Computer Science & Technology

B. Tech. II Year II Semester

18CST204 DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY

Course Prerequisite: 18CSE201, 18CST201

L	T	P	C
0	0	3	1.5

Course Description:
This course is aimed to provide hands on experience to analyze the time complexity of sorting, graph, tree, branch and bound algorithms.

Course Objectives:
1. To learn how to analyze a problem & design the solution for the problem.
2. To Strengthen the ability to identify and apply the suitable algorithm for the given real world problem.
3. To develop the optimal solution, i.e., time complexity & space complexity must be very low.

List of Experiments:
1. Sort a given set of elements using the Quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted. The elements can be read from a file or can be generated using the random number generator.
2. Using OpenMP, implement a parallelized Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted. The elements can be read from a file or can be generated using the random number generator.
3. a. Obtain the Topological ordering of vertices in a digraph.
   b. Compute the transitive closure of a given directed graph using Warshall's algorithm.
4. Implement 0/1 Knapsack problem using Dynamic Programming.
5. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijikstra‟s algorithm.
6. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal’s algorithm.
7. a. Print all the nodes reachable from a given starting node in a digraph using BFS method.
   b. Check whether a given graph is connected or not using DFS method.
8. Find a subset of a given set S = {s_l, s_2,.....,s_n} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {2, 3, 5, 7, 8} and d = 10 there are three solutions {2,3,5}, {3,7}. And {2,8}. A suitable message is to be displayed if the given problem instance doesn't have a solution.
9. Implement any scheme to find the optimal solution for the Traveling Salesperson problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.
10. Find Minimum Cost Spanning Tree of a given undirected graph using Prim‟s algorithm.
11. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm. Parallelize this algorithm, implement it using OpenMP and determine the speed-up achieved.
12. Implement N Queen's problem using Back Tracking.

Course Outcomes:

At the end of the course, students will be able to

1. Implement divide and conquer strategy for real world scenarios.
2. Experiment the feasible solutions for various problems through greedy method and dynamic programming.
3. Implement Travelling Sales person problem using Back Tracking.
4. Implement N Queen's problem using Back Tracking.
5. Construct approximation algorithm to get optimal solution for a problem.

Reference Books:

1. Levitin A, “Introduction to the Design and Analysis of Algorithms”, Pearson Education, 2008.
2. Goodrich M.T.,R Tomassia, “Algorithm Design foundations Analysis and Internet Examples”, John Wileyn and Sons, 2006.
3. Base Sara, Allen Van Gelder, “Computer Algorithms Introduction to Design and Analysis”, Pearson, 3rd Edition, 1999.

Web References:

1. http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html
2. http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms
3. http://www.facweb.iitkgp.ernet.in/~sourav/daa.html

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

.

.

Dept. of Computer Science & Technology

B. Tech. II Year II Semester

18CST205 OPERATING SYSTEMS LABORATORY

L	T	P	C
0	0	3	1.5

Course Prerequisite: 18CSE201

Course Description:
This course will cover the tradeoffs that can be made between performance and functionality during the design and implementation of an operating system. Particular emphasis will be given to three major OS subsystems: process management (processes, threads, CPU scheduling, synchronization, and deadlock), memory management (segmentation, paging, swapping), and file systems.

Course Objectives:
1. To learn the mechanisms of OS to handle processes and threads and their communication
2. To learn the mechanisms involved in memory management in contemporary OS
3. To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
4. To know the components and management aspects of concurrency management.

LIST OF EXPERIMENTS

1. To Study basic concepts in OS with the help of Linux commands.

2. a) Write a shell script that accepts two integers as its arguments and computers the value of first number raised to the power of the second number.
   b) Write a shell script that takes a command –line argument and reports on whether it is directory, a file, or something else.

3. a) Write a shell script that accepts one or more file name as arguments and converts all of them to uppercase, provided they exist in the current directory.
   b) Write a shell script that computes the gross salary of a employee according to the following rules:
      i)If basic salary is < 1500 then HRA =10% of the basic and DA =90% of the basic.
      ii)If basic salary is >=1500 then HRA =Rs500 and DA=98% of the basic
      The basic salary is entered interactively through the key board.

4. a) Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
   b) Develop an interactive script that ask for a word and a file name and then tells how many times that word occurred in the file.

5. Simulate the following CPU scheduling algorithms
   a) Round Robin b) SJF c) FCFS d) Priority

6. Program on process creation and Execution
   a) To display Environment variables.
   b) To implement Different types of exec functions.

7. a) Write a program to create a chain of Processes.
   b) Demonstration of Zombie and Orphan process.

8. Write a program for Producer Consumer Problem.

9.Write a program to create pipes.
10. Write a Program to find whether a file is having read, write, execute permissions and also check whether a given name is file or directory.
11. Simulate MVT and MFT.
12. Simulate all page replacement algorithms
13. Simulate all file allocation strategie
    a) Sequential b) Indexed c) Linked

Course Outcomes:
At the end of the course the student will be able to
1. Discuss basic shell commands in linux environment.
2. Develop shell script for solving logical problems.
3. Implement CPU Scheduling algorithms.
4. Evaluate memory management techniques.
5. Implement page replacement algorithms.

Textbooks:
1. Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India

References:
1. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
2. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
3. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
4. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech III Year I Semester

Dept. of Computer Science & Technology

B. Tech. III Year I Semester

18CST107 COMPUTER ORGANIZATION AND ARCHITECTURE

L	T	P	C
3	0	0	3

Course Prerequisite: 18CST101

Course Description:

This course aims at introducing the concepts of computer architecture and organization. It involves design aspects, and deals with the current trends in computer architecture. It also aims to improve system performance by effective utilization of system resources such as memory and I/O subsystems.

Course Objectives:

1. To make students understand the basic structure and operation of digital computer.
2. To understand the hardware-software interface.
3. To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.
4. To expose the students to the concept of pipelining.
5. To familiarize the students with hierarchical memory system including cache memories and virtual memory.
6. To expose the students with different ways of communicating with I/O devices and standard I/O interfaces.

UNIT I: OVERVIEW & INSTRUCTIONS:

Eight ideas – Components of a computer system – Technology – Performance – Power wall – Uniprocessors to multiprocessors; Instructions – operations and operands – representing instructions – Logical operations – control operations – Addressing modes **(9)**

UNIT II: ARITHMETIC OPERATIONS:

ALU - Addition and subtraction – Multiplication – division(Fixed point and floating point); Conversion between integer and real numbers; The generation of higher order functions from square roots to transcendentalfunctions; Representation of non-numeric data (character codes, graphical data) **(9)**

UNIT III: PROCESSOR AND CONTROL UNIT:

Basic MIPS implementation – Building datapath – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions. **(9)**

UNIT IV: PARALLELISM:

Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware multithreading – Multicore processors. **(9)**

UNIT V: MEMORY AND I/O SYSTEMS:

Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - Virtual memory, TLBs - Input/output system, programmed I/O, DMA and interrupts, I/O processors. **(9)**

Dept. of Computer Science & Technology

Course Outcomes:

1. Review basic operations and addressing modes of a computer Architecture
2. Classify arithmetic and logical operations
3. Illustrate the key concepts of pipelining .
4. Discuss parallel processing architectures and its classification.
5. Understand the concepts of Memory hierarchy and I/O interfaces

Textbooks:

1. David A. Patterson and John L. Hennessey, "Computer organization and design‟, Morgan Kauffman / Elsevier, Fifth edition, 2014.
2. V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation", VI th edition, Mc Graw-Hill Inc, 2012.

References:

1. William Stallings "Computer Organization and Architecture" , Seventh Edition , Pearson Education, 2006.
2. Vincent P. Heuring, Harry F. Jordan, "Computer System Architecture", Second Edition, Pearson Education, 2005.
3. Govindarajalu, "Computer Architecture and Organization, Design Principles and Applications", first edition, Tata McGraw Hill, New Delhi, 2005.
4. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata Mc Graw Hill, 1998.
5. http://nptel.ac.in/.

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination

Dept. of Computer Science & Technology

B. Tech. III Year I Semester

18CST108 COMPUTER NETWORKS

L	T	P	C
3	0	0	3

Course Description:
The main emphasis of this course is to introduce to computer communication, TCP/IP layers functionalities, and operations of network protocols.

Course Objectives:
1. To study the evolution of computer networks, foundational principles, architectures, and techniques employed in computer networks.
2. To study the concepts of communication networks from layered perspective
3. To provide students with a theoretical and practical base in computer networks issues
4. Student will be able purse his study in advanced networking courses
5. To Prepare students for easy transfer from academia into future directions of research.

UNIT I INTRODUCTION
Introduction: Networks, Network Types, Internet History, Standards and Administration, Network Models: Protocol Layering, TCP/IP Protocol Suite, The ISO Model.
THE PHYSICAL LAYER
Data and Signals, Transmission impairment, Data rate limits, Performance, Transmission media: Introduction, Guided Media, Unguided Media, Switching: Introduction, Circuit Switched Networks, Packet switching. **(9)**

UNIT II THE DATA LINK LAYER
Introduction, Link layer addressing, Error detection and Correction: Cyclic codes, Checksum, Forward error correction, Data link control: DLC Services, Data link layer protocols, HDLC, Point to Point Protocol, Media Access control: Random Access, Controlled Access, Channelization, connecting devices and virtual LANs: Connecting Devices. **(9)**

UNIT III THE NETWORK LAYER
Network layer design issues, Routing algorithms, Congestion control algorithms, Quality of service, Internetworking, The network layer in the Internet: IPV4 Addresses, IPV6, Internet Control protocol, OSPF, BGP, IP, ICMPv4, IGMP **(9)**

UNIT IV THE TRANSPORT LAYER
The Transport Service, Elements of Transport Protocols, Congestion Control, The internet transport protocols: UDP, TCP, Performance problems in computer networks, Network performance measurement. **(9)**

UNIT V THE APPLICATION LAYER
Introduction, Client Server Programming, WWW and HTTP, FTP, e-mail, TELNET, Secure Shell, Domain Name System, SNMP. Case study- Computer Networks in health care. **(9)**

Course Outcomes:
1. Understand the key concepts of OSI & TCP/IP models and Transmisssion Media.
2. Discuss aboout data link layer and its protocols.
3. Understand routing algorithms and network layer protocols.
4. Examine the performance issues associated with transport layer protocol.
5. Identify the usage of application layer protocols in the network related domains.

Textbook:

1. "Data communications and networking", Behrouz A. Forouzan, Mc Graw Hill Education,5th edition, 2012.
2. "Computer Networks", Andrew S. Tanenbaum, Wetherall, Pearson,5th edition, 2010.

References:

1. "Data Communication and Networks", Bhushan Trivedi, Oxford
2. "Internetworking with TCP/IP – Principles, protocols, and architecture", Volume 1, Douglas E. Comer, 5th edition, PHI
3. "Computer Networks", 5E, Peterson, Davie, Elsevier.
4. "Introduction to Computer Networks and Cyber Security", Chawan- Hwa Wu, Irwin, CRC Publications.
5. "Computer Networks and Internets with Internet Applications", Comer.

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination

Dept. of Computer Science & Technology

B. Tech. III Year I Semester

18CST109 FORMAL LANGUAGE AUTOMATA AND COMPILER DESIGN

L	T	P	C
3	0	0	3

Course Prerequisite: 18MAT112

Course Description:
This course aims to introduce the students to the theoretical foundation for the process of computation. This course aims to introduce the students to components of compiler and its implementation. This course covers introduction to compilers, Phases of compilers, Lexical Analysis, Syntax Analysis, and Semantic Analysis, Symbol tables, Code Optimization and Code generation.

Course Objectives:

1. To recall the basic concepts of set theory, introduce the concept of regular expressions, and learn DFA, NFA, conversion of DFA to NFA.To learn Context Free Grammar (CFG), and Context Free Languages (CFL's)
2. **T**o make understanding of Parsing and Semantics.
3. To provide a basic understanding of Context Sensitive features.
4. To provide a basic understanding of Code Optimization
5. To provide an overview of Code generation

UNIT I:
Formal Language and Regular Expressions: Languages, Definition Languages regular expressions, Finite Automata – DFA, NFA. Conversion of regular expression to NFA, NFA to DFA. Applications of Finite Automata to lexical analysis, lex tools. **Context Free grammars and parsing:** Context free grammars, derivation, parse trees, ambiguity LL(K) grammars and LL(1) parsing. **(9)**

UNIT II:
Bottom up parsing handle pruning LR Grammar Parsing, LALR parsing, parsing ambiguous grammars, YACC programming specification. **Semantics:** Syntax directed translation, S-attributed and L-attributed grammars, Intermediate code – abstract syntax tree, translation of simple statements and control flow statements. **(9)**

UNIT III:
Context Sensitive features – Chomsky hierarchy of languages and recognizers. Type checking, type conversions, equivalence of type expressions, overloading of functions and operations. **(9)**

UNIT IV:
Run time storage: Storage organization, storage allocation strategies scope access to now local names, parameters, language facilities for dynamics storage allocation. **Code optimization :** Principal sources of optimization, optimization of basic blocks, peephole optimization, flow graphs, Data flow analysis of flow graphs. **(9)**

UNIT V:
Code generation: Machine dependent code generation, object code forms, generic code generation algorithm, Register allocation and assignment. Using DAG representation of Block. **(9)**

Course Outcomes:
1. Apply Automata techniques for a given Grammar.
2. Analyze the parsing techniques and semantics.analysis for a given grammer.
3. Interpret the Context Sensitive Features.
4. Analyze optimization techniques to get the target code.
5. Implement code generation algorithms.

TEXT BOOKS:
1. Introduction to Theory of computation. Sipser, 2nd Edition, Thomson.
2. Compilers Principles, Techniques and Tools Aho, Ullman, Ravisethi, Pearson Education.

REFERENCES:
1. Modern Compiler Construction in C , Andrew W.Appel Cambridge University Press.
2. Compiler Construction, LOUDEN, Thomson.
3. Elements of Compiler Design, A. Meduna, Auerbach Publications, Taylor and Francis Group.
4. Principles of Compiler Design, V. Raghavan, TMH.
5. Engineering a Compiler, K. D. Cooper, L. Torczon, ELSEVIER.
6. Introduction to Formal Languages and Automata Theory and Computation - Kamala Krithivasan and Rama R, Pearson.
7. Modern Compiler Design, D. Grune and others, Wiley-India.
8. A Text book on Automata Theory, S. F. B. Nasir, P. K. Srimani, Cambridge Univ. Press.
9. Automata and Language, A. Meduna, Springer.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

B. Tech. III Year I Semester

18CST110 AI TOOLS, TECHNIQUES AND APPLICATIONS

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description:
To understand the importance of AI and its applications, Machine learning algorithms, and smart solutions for various domains.

Course Objectives:
The objectives of this course are to
1. Expose fundamental concepts in AI
2. Demonstrate the capability to create simple AI applications using Natural Language Processing, Audio engineering & Speech, Computer Vision, pattern recognition and machine learning.
3. Present various modeling and formulation techniques to solve problems using AI techniques.
4. Introduce state-of-art AI tools and techniques to solve various problems faced by Engineers in design and analysis.

UNIT I: FUNDAMENTALS OF AI
AI-Definition, Applications of AI, Search Strategies – BFS, DFS, Knowledge representation and reasoning – Knowledge based Agent, Wumpus World Environment, Logics.**Machine Learning:** Supervised Learning - Linear Regression, Logistic Regression, Unsupervised Learning – K-means clustering, Anamoly Detection, Reinforcement Learning. **(9)**

UNIT II: NLP AND BOT TECHNOLOGIES
Natural Language Processing: Natural language Understanding, Sentiment Analysis, Segmentation and recognition, Speech Recognition, Text-to-Speech, NLP in the cloud, NL Interface, **Chatbots:** Chatbot definition, Build a Chatbot, How has chatbot transformed user experience, Designing elements, best practices for chatbot development, **Virtual Assistants:** What is a Virtual Assistant? **(9)**

UNIT III: IMAGE PROCESSING &APPLICATIONS:
What is Image processing?, Image Noise, Removal of Noise from Images, Color Enhancement,Fourier transforms, Feature detection and matching, Segmentation**,** Object detection, Face recognition, Recognition Databases and test sets. Application: Optical Character Recognition. **(9)**

UNIT IV: DEEP LEARNING
Introduction - Neural Networks, Deep Learning, Different types of Deep Neural Networks - CNN,RNN, forward propagation, Cost function, backpropagation.APIs using softwares Tensorflow and Keras. **(9)**

UNIT V: SMART APPLICATIONS
Smart Agriculture, Smart Transportation and Autonomous Vehicles, Smart Homes, Smart Cities. **(9)**

Dept. of Computer Science & Technology

Course Outcomes:

Upon the completion of the course, students able to

1. Apply the basic concepts and applications of Artificial Intelligence.
2. Analyze Natural Language Processing andChat bots.
3. Interpret the features of digital image processing and its applications.
4. Contrasting deep learning techniques features.
5. Illustrating smart applications using modern technologies.

Textbooks:

1. Tom Markiewicz & Josh Zheng,Getting started with Artificial Intelligence, Published by O'Reilly Media,2017

2. Stuart J. Russell and Peter Norvig, Artificial Intelligence A Modern Approach

Reference Books:

1. Aurélien Géron,Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O'Reilly Media, 2017

2. A classical approach to Artificial Intelligence, Munesh Chandra Trivedi, Khanna Publications

3. Artificial Intelligence and Machine Learning, Chandra S.S. & H.S. Anand, PHI Publications

4. Machine Learning, Rajiv Chopra, Khanna Publishing House

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

B. Tech. III Year I Semester

18ENG202 CORPORATE COMMUNICATION LABORATORY
(Common to all branches)

Course Prerequisite: **18ENG201**

L	T	P	C
0	0	2	1

Course Description: English is practical and it is a must for any institution to provide students with opportunities to indulge in actively applying their language skills. Thus the Communication Skills Lab facilitates students with adequate opportunities to put their communication skills in use. It also accommodates peer learning by engaging students in various interactive sessions. This lab will be accompanied by a practical lab component.

Course Objectives: This course enables the students to –

1. Focus on their interactive skills
2. Develop their communicative competency
3. Fortify their employability skills
4. Empower their confidence and overcome their shyness
5. Become effective in their overall performance in the industry

UNIT I LISTENING AND SPEAKING SKILLS

Conversational skills (Formal and Informal); Group Discussion; Making effective presentations using Computers; Listening/watching interviews, conversations, documentaries, etc.; Listening to lectures, discussions from TV/Radio/Podcast. **(9)**

UNIT II READING AND WRITING SKILLS

Reading different genres of texts ranging from newspapers to creative writing; Writing job applications and resume; Emails; Letters; Memorandum; Reports; Writing abstracts and summaries; Interpreting visual texts. **(8)**

UNIT III ACCLIMATIZING STUDENTS TO OTHER EXAMS

Test of English as a Foreign Language (TOEFL); Civil Service Examinations; Verbal- -ability. **(5)**

UNIT IV INTERVIEW SKILLS

Different types of interviews: Answering questions and offering information; Mock interviews; Body Language; Articulation of sounds; Intonation. **(8)**

Course Outcomes:

At the end of the course, learners will be able to:

1. Read articles from magazines and newspapers
2. Participate effectively in informal conversations
3. Introduce themselves and their friends and express opinions in English
4. Comprehend conversations and short talks delivered in English
5. Write short essays of a general kind, draft Reports and personal letters and emails in English.

Suggested Reading/Textbook:

1. Sanjay Kumar and Pushp Lata; *Communication Skills*; Oxford University Press, 2012.
2. Sabina Pillai and Agna Fernandez; *Soft Skills and Employability Skills*; Cambridge University Press, 2018.
3. S.P. Dhanavel; *English and Communication Skills for Students of Science and Engineering*; Orient Blackswan, 2009.
4. M. Ashraf Rizvi; *Effective Technical Communication*; Tata Mc Graw Hill Co. ltd, 2005.

Reference:

1. Dr. M.Adithan; *Study Skills for Professional Students in Higher Education*; S.Chand & Co. Pvt., 2014.
2. Guy Brook Hart & Vanessa Jakeman; *Complete IELTS*: Cambridge University Press, 2014.
3. Vanessa Jakeman & Clare Mcdowell; *Action Plan for IELTS:* Cambridge University Press, 2006.
4. Guy Brook Hart; *Instant IELTS*; Cambridge University Press, 2004.
5. S.P.Bakshi & Richa Sharma; *Descriptive General English;* Arihant Publications, 2012.
6. Charles Browne, Brent Culligan 7 Joseph Phillips; *In Focus (level 2);* Cambridge University Press.
7. Steven Gershon; *Present Yourself 2* (second edition); Cambridge University Press.
8. Leo Jones; *Let's Talk 3* (second edition); Cambridge University Press.
9. Nutall J. C.; *Reading Comprehension*; Orient Blackswan.
10. *www.cambridgeenglish.org/in/*
11. https://learnenglish.britishcouncil.org/en/english-grammar
12. https://www.rong-chang.com/

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Dept. of Computer Science & Technology

B. Tech. III Year I Semester

18CST206 COMPUTER NETWORKS LABORATORY

Course Prerequisite: Object Oriented Design

L	T	P	C
0	0	3	1.5

Course Description:
This course helps the students to understand comprising simulation of various protocols and performance; TCP/IP Level Programming, Routing Algorithms and internetworking.

Course Objectives:
1. To provide the students the ideas of Cabling, outlet installation, addressing, LAN setup, and configuring a router.
2. To provide students with a theoretical and practical base in computer networks protocols
3. Student will be able purse his study in advanced networking courses
4. Prepare students for easy transfer from academia into practical life
5. To provide the students the awareness of simulation tools

LIST OF EXPERIMENTS

1. Practice Cable & RJ-45 Jack outlet installation
2. Practice IP Addressing & Sub-netting Concepts
3. Practice LAN setup and Router configuration
4. Write a program to implement stop and wait protocol & sliding window protocol
5. Write a program to implement ARP /RARP protocols
6. Write a program to simulate ping/traceroute command
7. Write a program to generate CRC code for checking error.
8. Create a socket for HTTP for webpage upload and download
9. Write a program for client Server chat application
10. Perform Protocol analysis, Packet Capture & Traffic Analysis with Wireshark
11. Implement with a wired network using NS2 programming with 10 nodes with any topology.
12. Write a program to transfer data between two nodes using NS
13. Write a program to simulate data transfer and packet loss using NS
14. Write a program to simulate Congestion Control Algorithms using NS

Project Based Learning:

1. Study the LAN setup, routing configuration, sub-netting, and network infrastructure of your institution, and write a detailed report on it.
2. Design and Develop a mini project using NS simulator

Course Outcomes:
After completing this course, the students should be able to
1. Practice the key concepts of topology for network setup
2. Implement Network routing protocols.
3. Evaluate the procedure of error correcting techniques in data link layer.
4. Establish a client server model using socket programming
5. Demonstrate the installation procedure of network simulator.

References:

1. "Data communications and networking", Behrouz A. Forouzan, Mc Graw Hill Education, 5th edition, 2012.
2. "Computer Networks", Andrew S. Tanenbaum, Wetherall, Pearson,5th edition, 2010.
3. "Understanding Communications and Networks", Third Edition, W.A.Shay, Cengage Learning.
4. "Computer Networking: A Top-Down Approach Featuring the Internet", James F.Kurose,
5. K.W.Ross, Third Edition, Pearson Education.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Dept. of Computer Science & Technology

B. Tech. III Year I Semester

18CST207 AI TOOLS, TECHNIQUES AND APPLICATIONS LABORATORY

	L	T	P	C
Course Prerequisite: None	**0**	**0**	**3**	**1.5**

Course Description:

Performing data labelling, building custom models, object recognition, speech recognition, building chatbot, configuring neural network, building virtual assistant, and building convolutional neural network.

Course Objectives:

The objectives of this course are to

1. Perform data labelling
2. Develop custom models for object recognition
3. Build chatbot.
4. Configure neural network.

LIST OF EXPERIMENTS

1. Implement simple linear regression to predict profits for a food truck based on the population of the city that the truck would be placed in.
2. Build a classification model that estimates the probability of admission based on the exam scores using logistic regression.
3. Implement un-regularized and regularized versions of the neural network cost function and compute gradients via the backpropagation algorithm.
4. Implement an anomaly detection algorithm using a Gaussian model and apply it to detect failing servers on a network.
5. Supervisely - Perform Data Labelling for various images using object recognition
6. Lobe.ai - Build custom models using the visual tool for Object recognition and sentiment analysis that can convert facial expressions into emoticons
7. Teachable Machine - In Browser Object Recognition through Brain.JS
8. Liv.ai - App for Speech recognition and Synthesis through APIs
9. Building a Chatbot using AWS Lex, Pandora bots
10. Configure an existing Neural Network by manipulating various parameters involved
11. Build a virtual assistant for Wikipedia using Wolfram Alpha and Python
12. Build a Convolutional Neural Network for Cat vs Dog Image Classification

Course Outcomes:

At the end of the course student will be able to

1. Develop Regression and Classification problems
2. Implement Anamoly detection algorithm in unsupervised learning
3. Discover the methods for object detection.
4. Develop Chatbots and assistants using online platforms
5. Demonstrate the classification problems using Neural networks

Dept. of Computer Science & Technology

Textbooks:

1. Tom Markiewicz & Josh Zheng,Getting started with Artificial Intelligence,Published by O'Reilly Media,2017
2. Programming collective Intelligence: Building Smart Web 2.0 Applications-Toby Segaran
3. Building Machine Learning systems with Python, Willi Richart Luis Pedro Coelho
4. Python Machine Learning by Example, Liu, Yuxi(Hayden),Packt Publishers
5. Stuart J. Russell and Peter Norvig,Artificial Intelligence A Modern Approach

References:

1. Aurélien Géron,Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O'Reilly Media,2017
2. Machine Learning with Python, Abhishek Vijayvargia, BPB publications
3. Python Machine Learning, Sebastian Raschka, packt publishers

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech III Year II Semester

Dept. of Computer Science & Technology

B. Tech. III Year II Semester

18ENG102 ENGLISH COMMUNICATION - READING AND WRITING
(Common to all branches)

L	T	P	C
2	0	0	2

Course Prerequisite: 18ENG101

Course Description: As the students being exposed to the global language 'English; it has become a widespread need. This course builds on what was offered in the first semester and facilitates deeper understanding into the mechanics of the English language, especially in regard to two particular skills, i.e. Reading and Writing. This course is offered in order to help students cultivate and nurture a mind that "think in English." Intricate issues of understanding academic texts, vocabulary needed to comprehend texts, evaluate and analyze writing tasks, etc.

Course Objectives: This course enables students to –

1. Hone in on their reading skills
2. Cultivate critical reading and writing skills
3. Develop crucial comprehension of texts, graphs and graphics
4. Enhance vocabulary for greater communicative impact
5. Overall development in the English language

UNIT 1: Reading for main ideas; Applying background knowledge to predict content; Skimming; Scanning; Making inferences; Understanding discourse **(6)**

UNIT 2: Identifying audience; Reading for detail; Using visuals; Academic vocabulary, collocations and synonyms. **(6)**

UNIT 3: Scanning to find crucial information; Using critical thinking to identify purpose; Previewing; Topic related vocabulary; Writing an introduction; Essay structure; Descriptive paragraphs; Writing a conclusion. **(6)**

UNIT 4: Analyzing essay questions; Writing a problem-solution based on graphs and graphics; Developing own ideas. **(6)**

UNIT 5: Writing cause-effect paragraphs; Evaluating diagrams; Brainstorming; Academic verbs and topical language. **(6)**

Course Outcomes: At the end of the course, learners will be able to

1. Read and comprehend academic texts, graphs, diagrams and graphics
2. Develop crucial thinking skills
3. Write purposefully and effectively
4. Enhance vocabulary
5. Overall development in the English language

Suggested Reading/Textbook:

1. Carolyn Westbrook; *Unlock 3 series (B1): Reading & Writing;* Published by: Cambridge University Press.

Reference:

1. Adrian Doff, Craig Thaine, Herbert Puchta, et al; *Empower: Upper Intermediate (B2+)*; Published by: Cambridge University Press.
2. Josh Sreedharan; *The Four Skills for Communication*; Cambridge University Press, 2014.
3. V. Sasikumar,P.Kiranmai Dutt, Geetha Rajeevan; *A Course in Listening & Speaking II*; Cambridge University Press, 2014.
4. Liz Driscoll; *Reading Extra*; Cambridge University Press, 2004.
5. Graham Palmer; *Writing Extra*; Cambridge University Press, 2004.
6. *Writing Tutor*; Advanced English Learners' Dictionary, 9th Edition; Oxford University Press, 2012.
7. *https://www.nypl.org/blog/2012/11/28/11-great-free-websites-practice-english*
8. *www.readbrightly.com/6-great-websites-teen-writers/*

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

B. Tech. III Year II Semester

18CST111 INTERNET OF THINGS

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description:
The Internet of Things (IoT) is a network of a wide variety of devices like vehicles, humans, soil etc. These devices gather data using sensors, which can be used for monitoring or control. This course is an introduction to the embedded devices, communication protocols and APIs used in IoT.

Course Objectives:
1. Introduce the fundamental concepts of IoT and physical computing
2. Expose the student to a variety of embedded boards and IoT Platforms
3. Create a basic understanding of the communication protocols in IoT communications.
4. Familiarize the student with application program interfaces for IoT.
5. Enable students to create simple IoT applications.

UNIT –I: OVERVIEW OF IOT
The Internet of Things: An Overview; The Flavor of the Internet of Things; The "Internet" of "Things"; The Technology of the Internet of Things; Enchanted Objects; Who is Making the Internet of Things?; Design Principles for Connected Devices; Calm and Ambient Technology; Privacy; Keeping Secrets; Whose Data Is It Anyway?; Web Thinking for Connected Devices; Small Pieces, Loosely Joined; First-Class Citizens On The Internet; Graceful Degradation; Affordances **(9)**

UNIT –II: EMBEDDED DEVICES – I (ARDUINO)

Embedded Computing Basics; Microcontrollers; System-on-Chips; Choosing Your Platform; Arduino; Developing on the Arduino; Some Notes on the Hardware; Openness **(9)**

UNIT –III: EMBEDDED DEVICES – II (RASPBERRY PI)

Raspberry Pi ; Cases and Extension Boards; Developing on the Raspberry Pi; Some Notes on the Hardware; Openness; Other notable platforms; Mobile phones and tablets; Plug Computing: Always-on Internet of Things **(9)**

UNIT –IV: COMMUNICATION IN THE IOT

Internet Principles; Internet Communications: An Overview ; IP; TCP; The IP Protocol Suite (TCP/IP); UDP ; IP Addresses; DNS ; Static IP Address Assignment ; Dynamic IP Address Assignment; IPv6 ; MAC Addresses ; TCP and UDP Ports ; An Example: HTTP Ports ; Other Common Ports; Application Layer Protocols- HTTP; HTTPS: Encrypted HTTP ; Other Application Layer Protocols. **(9)**

UNIT –V: PROTOTYPING ONLINE COMPONENTS
Getting Started with an API; Mashing Up APIs; Scraping; Legalities; Writing a New API; Clockodillo; Security; Implementing the API; Using Curl to Test; Going Further; Real-Time Reactions; Polling; Comet; Other Protocols ; MQ Telemetry Transport; Extensible Messaging and Presence Protocol; Constrained Application Protocol. **(9)**

Course Outcomes:
After completing this Unit, students will be able to
1. Enumerate the core concepts of the Internet of Things (IoT).
2. Compare embedded computing platforms.
3. Demonstrate the process of developing IoT applications using Raspberry Pi
4. Articulate the key principles of protocols in IoT networks.
5. Apply secure communication protocols for IoT applications by integrating and testing online components through APIs.

Textbook:

1. Adrian McEwen, Hakim Cassimally, Designing the Internet of Things, Wiley Publications, 2014, ISBN:978-1-118-43062-0.
2. Arshdeep Bahga, Vijay Madisetti, Internet of Things: A Hands-On Approach, Universities Press, 2015. ISBN: 978-8173719547

Reference Books:

1. Pethuru Raj, Anupama C. Raman, The Internet of Things, Enabling technologies and use cases, CRC Press. 2017. ISBN: 978-1498761284.
2. Matt Richardson & Shawn Wallace, Make:Getting Started with Raspberry Pi, O'Reilly, 3rd Edition, 2016, ISBN:978-1-680-45246-4.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

B. Tech. III Year II Semester

18CST112 SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

Course Prerequisite: None.

Course Description:
This course presents software engineering techniques and explains the software development life-cycle, including software specification, Requirement analysis, design implementation, testing and maintenance. This course covers on past and current trends in software development practices. This course is designed to cover fundamentals of Software Engineering concepts, requirement analysis, process models, Design issues, modeling, testing strategies, Risk strategy, quality management. The course will present a variety of tools, in the context of team production of publicly releasable software. The main goal of this course for each student to build their ability to do useful applications that could be released for real-world use.

Course Objectives:
1. To make students to learn Different life cycle models.
2. To make students to learn different phases in software engineering.
3. To make students to learn about testing strategies.
4. To provide better understanding of software quality and assurance techniques.

UNIT I: BASIC CONCEPTS OF SOFTWARE ENGINEERING AND PROCESS MODEL
Introduction to Software Engineering: Ethics of Software engineering, Type of software, Software characteristics, Software Lifecycle model, Capability Maturity Model Integration (CMMI), **Process models:** The waterfall model, Incremental process models, spiral model, **Agile Development**-Agile Process - Other Agile process Frameworks: Adaptive process models, Scrum, Dynamic Systems Development Method and Crystal **(9)**

UNIT II: SOFTWARE REQUIREMENT ENGINEERING AND SYSTEM MODELS
Software Requirements: Functional and Non-functional requirements, User requirements, System requirements, Interface specification, and the software requirements specification (SRS).**Requirements engineering process:** Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management. **System models:** Context Models, Behavioral models, Data models, Object models. **(9)**

UNIT III: SOFTWARE DESIGN AND ENGINEERING
Design Engineering: Design process and Design quality, Design concepts, the design model, pattern based software design, Object oriented Analysis and Design (using UML): Class diagrams, Use diagrams, Interaction diagrams, activity diagrams. **Modeling component-level design:** Designing class-based components, conducting component-level design, Object constraint language, designing conventional components. **Performing User interface design**: Golden rules, User interface analysis and design, interface analysis. **(9)**

UNIT IV: SOFTWARE TESTING AND METRIC PROCESS
Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing. **Product metrics**: Software Quality, Frame work for Product metrics, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance. **Metrics for Process and Products:** Software Measurement, Metrics for software quality. **(9)**

UNIT V: SOFTWARE QUALITY ASSUARANCE

Software Quality: Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews. **Software Quality Assurance**: Statistical Software Quality Assurance, Software reliability, The ISO 9000 quality standards**,** Principles of Software Process Change.

(9)

Course Outcomes:

Upon completion of this course the students will be able to:

1. Discuss the basic concepts of software engineering.
2. Explain the basic software requirements and models .
3. Articulate the Software Engineering process
4. Interpret testing strategies of software projects.
5. Summarize Software quality management process.

Textbooks:

1. Software Engineering: A practitioner's Approach, Roger S Pressman, 9th Edition. McGrawHill International Edition, 2020

2. Engineering Software Products: An Introduction to Modern Software Engineering: Ian Sommerville, First Edition, Pearson Education, 2019.

3. Agile Product Management with Scrum, Pichler Roman, Pearson Education,2010.

References:

1. Fundamentals of Software Engineering: Rajib Mall, PHI, 2005.

2. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India,2010.

3. Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008.

4. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.

5. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition,2006.

6. Software Engineering2: Specification of systems and languages, Diner Bjorner, Springer International edition, 2006.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

B. Tech. III Year II Semester

18CST208 INTERNET OF THINGS LABORATORY

L	T	P	C
0	0	3	1.5

Course Prerequisite: None

Course Description:

This course provide hands-on practices on IoT using Arduino & Raspberry microcontrollers with various interfaces such as sensors, actuators, mobile app, cloud, social media.

Course Objectives:

1. To understand working principles IOT.
2. To get exposure towards the technology fundamentals.
3. To understand the concepts of real world designs, industrial automation and commercial needs for design IOT enabled solution

LIST OF EXPERIMENTS

1. Study on IoT Platform

a) Getting information and study of IOT microcontrollers (Arduino, Raspberry pi)

2. Study on IoT Platform

a) Getting information about Sensors (IR, temperature, pressure, gas sensor)
b) Getting information about actuators. (Piezoelectric actuator, pneumatic actuator)

3. Programming with Arduino platform

a) Installation of Arduino in computer and verifying any errors in connection.
b) Control LED using Arduino
c) Traffic Light Control

4. Programming with Arduino platform and Reading from Sensors

a) interfacing sensors to Arduino board and getting information from them (any two sensors).
b) Experiment with both analog and digital sensors.

5. Programming with Raspberry pi

a) Displaying Date on Serial Monitor
b) Automated Door Opening System

6. Connecting Android Phone with Arduino

a) Connecting Arduino with Mobile Device Using the Bluetooth Module.
b) Control any two actuators connected to the development board using Bluetooth.

7. Integrating Ethernet Shield.

Read data from sensor and send it to a requesting client using socket communication. Note: The client and server should be connected to same local area network

8. Creating Mobile App

a) Create a mobile app to control an actuator.
b) Control Electronic Devices from anywhere across the world using Internet & Mobile App.

9. Interfacing Cloud

a) Push sensor data to cloud - Use Arduino to Upload data from Environmental Sensors to Cloud Server.
b) Control an actuator through cloud

10. Data analysis and Visualization

Access the data pushed from sensor to cloud and apply any data analytics or visualization services.

11. Social media with IoT

Creating Program for Local host Web Server for controlling devices and update status on Twitter through Arduino.

12. Mini Project

Identify a problem in your local area or college which can be solved by integrating the things you learned so far and create a prototype to solve it.

Course Outcomes:

At the end of the course, students will be able to

1. Choose the sensors and actuators for an IoT application.
2. Implement basic applications using Raspberry pi and Arduino.
3. Develop IoT application using Cloud platform.
4. Apply data analytics and visualization on IoT data.
5. Develop an IoT enabled solution for a real-world problem.

Text/ Reference Books:

1. Adrian McEwen, Hakim Cassimally, Designing the Internet of Things, Wiley Publications, 2014, ISBN:978-1-118-43062-0.
2. Arshdeep Bahga, Vijay Madisetti, Internet of Things: A Hands-On Approach, Universities Press, 2015. ISBN: 978-8173719547
3. Pethuru Raj, Anupama C. Raman, The Internet of Things, Enabling technologies and use cases, CRC Press. 2017. ISBN: 978-1498761284.
4. Matt Richardson & Shawn Wallace, Make:Getting Started with Raspberry Pi, O'Reilly, 3rd Edition, 2016, ISBN:978-1-680-45246-4.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Dept. of Computer Science & Technology

B. Tech. III Year II Semester

18CST209 SOFTWARE ENGINEERING LABORATORY

L	T	P	C
0	0	3	1.5

Course Prerequisite: None

Course Description:

.This course presents software engineering techniques and explains the software development life-cycle, including software specification, Requirement analysis, design implementation, testing and maintenance. This course covers on past and current trends in software development practices. This course is designed to cover fundamentals of Software Engineering concepts, requirement analysis, process models, Design issues, modeling, testing strategies, project management, Risk strategy, quality management. The course will present a variety of tools, in the context of team production of publicly releasable software. The main goal of this course for each student to build their ability to do useful applications that could be released for real-world use.

Course Objectives:

1. To make students to learn Different life cycle models.
2. To make students to learn different phases in software engineering.
3. To make students to learn about testing strategies.
4. To provide better understanding of software quality and project management techniques

LIST OF EXPERIMENTS

1. Course Registration system
2. Student marks analysing system
3. Online ticket reservation system
4. Platform assignment system for the trains in a railway station
5. Expert system to prescribe the medicines for the given symptoms
6. Remote computer monitoring
7. ATM system
8. Stock maintenance
9. Quiz System
10. E-mail Client system
11. An integrated email tool allowing participants to send announcement email messages to the entire class or to a subset of the entire class
12. A chat tool allowing synchronous communication among class Participants

Course Outcomes:

Upon completion of this course the students will be able to:

1. Analyses the software requirements specifications for a given problem
2. Sketch structure and behavior of UML diagrams for a given application.
3. Practice the usage of Chatbot
4. Integrate the knowledge of effective project management
5. Practice Project planning and Risk management process.

Textbooks:

1. Software Engineering: A practitioner's Approach, Roger S Pressman, Sixth Edition. McGrawHill International Edition, 2005
2. Software Engineering: Ian Sommerville, Seventh Edition, Pearson Education, 2004.
3. Managing the Software Process: *Watts S. Humphrey*, Pearson Education.
4. Software Project Management: *Walker Royce,* Pearson Education
5. Unified modeling Language User Guide: Grady Booch, James Rumbaugh, Iva Jacobson, Pearson Education

References:

1. Fundamentals of Software Engineering: Rajib Mall, PHI, 2005.
2. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India,2010.
3. Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008.
4. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
5. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition, 2006.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech IV Year I Semester

Dept. of Computer Science & Technology

B. Tech. IV Year I Semester

18CST113 DISTRIBUTED AND CLOUD COMPUTING

L	T	P	C
3	0	0	3

Course Prerequisite: 18CST109

Course Description:

This course will cover a top-down view of cloud computing, from applications and administration to programming and infrastructure. Its main focus is on cloud computing and large scale distributed systems which form the cloud infrastructure. Particular emphasis will be given to three major cloud computing systems: virtualization, cloud security and green cloud.

Course Objectives:

1. To explain distributed system and cloud models
2. To give introduction to distributed systems and cloud computing.
3. To apply distributed computational model and understand the need for cloud computing
4. To introduce the various levels of services that can be achieved by cloud.
5. To describe the security aspects in cloud.

UNIT I INTRODUCTOIN TO DISTRIBUTED SYSTEM MODELS AND CLOUD COMPUTING

Distributed System Models & Enabling technology: Scalable computing over the internet, Technologies for network-based system, System models for distributed & cloud, Software environments for distributed & Cloud. Time and Global States: Introduction, Clocks events and process states, synchronizing physical clocks, Logical clocks, Global states. Introduction to Cloud Computing: Cloud Computing in a Nutshell System Model for Distributed and Cloud Computing, Roots of Cloud Computing, Grid and Cloud, Layers and Types of Clouds, Desired Features of a Cloud, Basic Principles, of Cloud Computing, Challenges and Risks, Service Models. **(10)**

UNIT II VIRTUAL MACHINES AND VIRTUALIZATION OF CLUSTER AND DATA CENTRES

Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Virtual Machines and Virtualization of Cluster and Data Centres: Levels of Virtualization, Virtualization structures/Tools and Mechanism, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resources Management, Virtualization Data-Centre Automation. **(8)**

UNIT III SERVICE ORIENTED ARCHITECTURE FOR DISTRIBUTED COMPUTING

Service Oriented Architecture for Distributed Computing: Services & SOA, Message Oriented Middleware, Workflow in SOA. Cloud Programming & Software Environments: Features of Cloud & Grid, Parallel & Distributed programming paradigms, Programming support of Google Cloud, Amazon AWS & Azure. Case Studies: OpenStack & Aneka **(9)**

UNIT IV CLOUD SECURITY

Cloud Security, Data Security in the Cloud: An Introduction to the Idea of Data Security, The Current State of Data Security in the Cloud CryptDb: Onion Encryption layers- DET, RND, OPE, JOIN, SEARCH, HOM, and Homomorphism Encryption, FPE. **(9)**

UNIT V TRUST MANAGEMENT & GREEN CLOUD

Trust Management & Green Cloud Trust, Reputation and Security Management in P2P Systems, Load Balancing-HAProxy, Container based Virtualization-Docker, Green Cloud - Energy Consumption Models and Energy-aware Data Centers and Clouds

(9)

Course Outcomes:

At the completion of the course the students will be able to:

1. Interpret the distributed system models, cloud service and deployment models.
2. Discuss the needs of virtualization in a cloud environment.
3. Apply various service oriented architecture and environment models
4. Examine the different cloud security issues.
5. Classify the trust management and energy efficiency tools.

Textbooks:

1. George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair, DISTRIBUTED SYSTEMS Concepts and Design, Fifth Edition, Addison Wesley, 2012.

2. Kai Hwang, Geoffrey C. Fox, and Jack J. Dongarra: Distributed and Cloud Computing.

References:

1. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, “Cloud Computing: principles and paradigms (Wiley Series on Parallel and Distributed Computing), Wiley Publishing (c) 2011.

2. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter,
TATA McGraw- Hill , New Delhi – 2010.

3. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008.

4. Cloud computing for dummies- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, Wiley Publishing, Inc, 2010

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

B.Tech. IV Year I Semester

18CST114 MOBILE APPLICATION DEVELOPMENT

Course Prerequisite: 18CST102

L	T	P	C
3	0	0	3

Course Description:

This course is concerned with the development of applications on Android platform. Android is used as a basis for the development of mobile applications. This course starts with the basic concepts of Java, history of android and architecture. It introduces the major building blocks that are used to develop an android application with examples. It also covers the development of applications using widgets, events, networking. It provides ideas on sensors, their types and writing programs based on sensor classes for application development.

Course Objectives:

1. Understand Android history and its fundamentals and know the building blocks of android
2. Get idea on the creation of android user interface and its testing mechanisms
3. Identify the usage of threads, broadcast receivers, indents, services and their working methodology
4. Know about the storage mechanism in android using SQLite and the usage of content providers
5. Recognize the usage of android widgets and sensors in android based applications

UNIT- I INTRODUCTION AND INSTALLATION OF ANDROID TOOLS

Android Overview – History – Android Versions - Android Flavors. **Android Stack**: Linux, Native Layer and Hardware Abstraction Layer (HAL) – ART - Application Framework: Native C++ Library – Applications: System and User Applications - **Installation and Use of Android Tools:** Installing the Android SDK - Anatomy of an Android Project - Drawable Resources – XML Introduction - Creating user interface using XML – Overview of Android Building Blocks – Logging Messages in Android. **(9)**

UNIT- II USER INTERACTION

Example. Input Components – Text View – Image View – List View and Alert Dialogues – Menus: Popup, Options and Context Menus – Screen Navigation through App Bar – Recycler View – Material Design – Testing the User Interface: Expresso – Screen Navigation using Intents: Definition – Usage of Intends – Creation of Indents with example program – Lists and Adapters – Types of Adapters – Examples using Adapters. **(9)**

UNIT- III THREADS, LOADERS AND ASYNCTASK LOADER, BROADCAST RECEIVERS, SERVICES

Threading in Android – AsyncTask – Loaders – AsyncTask Loader – Connecting to Internet: JSON - HTTP API, Apache HTTP Client, HTTP URL Connection - Broadcast Receivers: Custom Broadcasts – Broadcasting Intends and their related API - Boot Receiver - Alarms and system services – Examples on alarms and services – Services: Services Life Cycle – Intent Service – Implementing Intent Service – Notifications: Managing Notifications. **(9)**

UNIT IV: SAVING, RETRIEVING AND LOADING DATA:

Android File systems and Files - Action Bar: Preferences and Action Bar - Shared Preferences – App Settings - Databases on Android - SQLite - Status Contract Class, Update Refresh Service – Cursors – Backups - Content Providers: Overview – Role of Content Providers - - Content Provider Example Program – Content Resolver. **(9)**

UNIT-V APPLICATIONS WIDGETS, INTERACTION AND SENSORS

App Widgets: Creation of Application Widgets - Interaction and Animation: Live Wallpaper and Handlers - Sensors: Sensor API in Android - Motion Sensor, Position Sensor, Environmental Sensor, Sensor Values, Sensor Manager Class, Sensor Class, Sensor Event class, Sensor Event Listener interface, Compass Accelerometer and orientation Sensors, Sensor Examples. **(9)**

Course Outcomes:

Upon successful completion of this course, students can able to:

1. Demonstrate the basic installation procedure of android application and its components.
2. Illustrate the user interface environment in android application
3. Discuss threads, broadcast receivers, and their services.
4. Articulate the procedure of storing and retrieving data using SQLite and Content Providers.
5. Apply widgets and sensor APIs in android application.

Textbooks:

1. Android Programming-The Big Nerd Ranch Guide, Bill Philips, Christ Stewart, Kristin Mariscano, Big Nerd Ranch publishers, 3rd Edition
2. Android Programming for Beginners, John Horton, PACKT publishers
3. Learning Android , By Marko Gargenta& Masumi Nakamura, O'Reilly, II Edition
4. Android Application Development All in One for Dummies, Barry Burd, Wiley, 2nd Edition

Reference Books:

1. Android application Development-Black Book, Pradeep Kothari, dreamtech
2. Android Programming - Unleashed, B.M.Harwani, Pearson Education, 2013
3. Head First Android Development: A Brain-Friendly Guide, Dawn Griffiths and David Griffiths, O’Reilly, 2nd Edition
4. Android System Programming, Roger Ye, PACKT publishers Programming Android,By Zigur dMednieks ,LairdDornin ,G.BlakeMeike & Masumi Nakamura, O'Reilly

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B.Tech. IV Year I Semester

18CST210 DISTRIBUTED AND CLOUD COMPUTING LABORATORY

Course Prerequisite: 18CST206

L	T	P	C
0	0	2	1

Course Description:

This course will cover a top-down view of cloud computing, from applications and administration to programming and infrastructure. Its main focus is on cloud computing and large-scale distributed systems which form the cloud infrastructure. Particular emphasis will be given to three major cloud computing systems: virtualization, cloud security and green cloud.

Course Objectives:

The student should be made to:

1. To learn the design and development process involved in creating a cloud-based application.
2. To learn to implement and use parallel programming using Hadoop Various.
3. To learn Various service models such as IaaS and PaaS and deployment models such as private, public, hybrid, and community.
4. To identify various security and privacy issues in cloud.

LIST OF EXPERIMENTS:

1. Implementation of Client/server using RPC/RMI.
2. Implementation of multi tread application
3. Implementation of Inter-process communication
4. Implementation of Load Balancing Algorithm.
5. Install VirtualBox/VMware Workstation with different flavours of linux or windows OS on top of windows OS.
6. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
7. Install Google App Engine. Create hello world app and other simple web applications using python/java.
8. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
9. Find a procedure to transfer the files from one virtual machine to another virtual machine.
10. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)

Course Outcomes:

After successful completion of this course, the students can be able to

1. Practice different communication models in distributed system.
2. Estimate various load balancing algorithms in Virtual machine.
3. Demonstrate various types of virtualization tools .
4. Execute simple web applications in Google app engine.
5. Simulate various scheduling algorithms using Cloudsim.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B.Tech. IV Year I Semester

18CST211 MOBILE APPLICATION DEVELOPMENT LABORATORY

Course Prerequisite: 18CST203, 18CST204

L	T	P	C
0	0	2	1

Course Description:

This Course introduces the concepts of advanced java that can be used in developing mobile applications. Students will get the capability to develop mobile based applications. Students will learn about record management system and generic framework. They will design and develop Mobile applications with the use of J2ME, like SMS, MMS, Gaming, Multimedia, JavaFX & Android.

Course Objectives:

The student should be made to:

1. Understand the installation of Android SDK
2. Get idea on the User Interface Design and their testing methodologies
3. Know the components of Android Building Blocks and how to use them for different application developments

LIST OF EXPERIMENTS:

1. Develop an android application to display a simple text in the emulator
2. Develop an android application to display the internal keyboard in the emulator
3. i. Write an android program to display a message in the toast
   ii. Write an android program to input a text through a text and the same must be displayed in the toast when a button is clicked on the screen
4. i. Develop an application to perform 5 arithmetic operations: Addition, Subtraction, Multiplication, Division and Modulo operation with necessary user interface creation
   ii. Develop an android application to process a student mark list by creating proper UI using the necessary controls
5. Write an android application to create a calculator
6. Create an android UI that consists of Different Departments of a company namely Production, Finance, Marketing and HR. If the user clicks on any department it should show details of that department. Use indents.
7. Design an android application to display a list of items on the android screen. If the user clicks any one of the list items a dialogue box should show that the user has clicked that particular item (Use array adopters)
8. Develop an android application to show some categories such as education, entertainment, health, provisions etc., If the user clicks on any one of the items it should show the sub categories of the category and if is again clicked it should the details of those items. (Use indents and lists)
9. i. Design an android application to create a service that shows the service is running in the background in the form of a toast

ii. Develop an android application to create an alarm using the concept of service

10. Develop an android application to demonstrate the concept of Fragments in Android
11. Develop an android application to demonstrate the database connectivity with the SQLite database to post and retrieve data through the User Interface
    (Example: Student mark list processing, Email Registration and Login, Products and sales)
12. Demonstrate the usage of Sensors in android by developing proper application.

Course Outcomes:

After successful completion of this course, the students can be able to

1. Develop basic android application for text and keyboard using emulator.
2. Implement mathematical operations on android emulator.
3. Design user interface for basic android applications.
4. Demonstrate the concept of alarm and fragment in android emulator.
5. Develop the mobile applications using SQLite

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

OPEN ELECTIVE – II

Dept. of Computer Science & Technology

Open Elective - II

18MAT301 ADVANCED NUMERICAL METHODS

L	T	P	C
3	0	0	3

Course Description

This course reviews and continues the study of computational techniques for evaluating interpolations, derivatives and integrals; solving system of algebraic equations, transcendental equations, ordinary differential equations and partial differential equations. The course emphasizes on numerical and mathematical methods of solutions with appropriate error analysis. The students use MATLAB as the computer language to obtain solutions to a few assigned problems.

Course Objectives

1. To introduce computation methods of solving algebraic and transcendental equations.
2. To avail the basics of numerical techniques for solving the system of linear equations.
3. To familiarize the knowledge of interpolation and numerical calculus.
4. To use numerical calculus for solving ordinary differential equations.
5. To introduce the computational techniques for solving partial differential equations.

UNIT I: SOLUTIONS OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS

Introduction to MATLAB, errors, sources of errors, floating point arithmetic, significant digits, relative error, propagation of errors, how to avoid loss of significant digits, evaluation of polynomial. Bisection method, False-position method, Secant method, Fixed-point iteration method, Newton's method – single and multiple roots, Order of convergence of the methods.
Exercises of Bisection method and Newton's method through MATLAB **(9)**

UNIT II: SOLUTIONS OF SYSTEM OF ALGEBRAIC EQUATIONS

Gaussian Elimination, LU decomposition, Thomas algorithm for the tridiagonal systems, Norms-Euclidean, mini-maxi, Frobenius and 1-,2- and ∞-norms, Condition numbers and errors in computed solutions. Jacobi's method, Gauss-Seidel method, Power method for obtaining eigenvalues and eigenvectors of matrices. Exercises of Gaussian Elimination and Gauss-Seidel method through MATLAB **(9)**

UNIT III: INTERPOLATION & NUMERICAL CALCULUS

Existence and Uniqueness of interpolating polynomial, Lagrange polynomials, Divided differences, Evenly spaced points, Error of interpolation, cubic spline, Inverse interpolation, Derivatives from difference table, Higher order derivatives, Trapezoidal rule, Simpsons rule, a composite formula, Gaussian Quadrature. Exercises of Divided differences and Simpson's rule through MATLAB **(9)**

UNIT IV: NUMERICAL SOLUTIONS TO ORDINARY DIFFERENTIAL EQUATIONS

Taylor series method, Euler and Modified Euler's method, Runge-Kutta methods for initial value problems, Shooting method, Finite difference method for boundary value problems.
Exercises of Runge-kutta method and Shooting method through MATLAB **(9)**

UNIT V: NUMERICAL SOLUTION TO PARTIAL DIFFERENTIAL EQUATIONS
Finite difference methods for one-dimensional Wave and Heat equations; Laplace and Poisson equations (five-point formula).Exercises of Finite difference method (forward, central and backward differentiation) and Crank-Nicolson method through MATLAB **(9)**

Course Outcomes

At the end of this course, students should be able to

1. Solve the system of algebraic and transcendental equations.
2. Apply the numerical techniques to find the solution to system of equations.
3. Calculate and analyze the rate of variations and numerical sum of such changes using numerical calculus relevant to the field of Engineering.
4. Find the accurate numerical solutions to ordinary differential equations representing some Engineering problems.
5. Compute the solutions for engineering problems represented by partial differential equations.

Text Books

1. Curtis F. Gerald, Patrich O. Wheatley, Applied Numerical Analysis, Pearson Education, 7th Edition, 2003.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.

Reference Books

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.
2. Burden and Faires, Numerical Analysis 7th ed., Thomson Learning, 2001.
3. Advanced Engineering Mathematics by E. Kreyszig, 10th ed., Wiley, 2010.
4. Applied Numerical Methods with MATLAB for Engineers and Scientists by Steven C. Chapra, 3rd ed., Mc Graw Hill, 2012.
5. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering, New Age International Ltd., 5th Edition, 2010.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Open Elective - II

18MAT302 ENGINEERING OPTIMIZATION

L	T	P	C
3	0	0	3

Course prerequisite: 18MAT101, 18MAT106, 18MAT104, 18MAT108, 18MAT109.

Course description: Unconstrained and constrained optimization, Linear programming problem, transportation and assignment problems, dynamic programming problem, project management and queuing models.

Course objectives:
1. Understand the optimization techniques for solving engineering problems.
2. Formulate and solve linear programming problem.
3. Obtain the optimal solution for transportation and assignment problems.
4. Avail knowledge to solve dynamic programming problem using recursive relations.
5. Analyze the techniques of project management and queuing models.

UNIT I: CLASSICAL OPTIMIZATION

Introduction to optimization, unconstrained optimization with single variable and multi variable. Constrained multivariable optimization with equality constraints- Lagrange multipliers method, constrained multivariable optimization with inequality constraints - Kuhn-Tucker conditions. **(9)**

UNIT II: LINEAR PROGRAMMING PROBLEM

Linear Programming Problem (LPP), Mathematical formulation, graphical solution, simplex method. Artificial variable technique - Big M-method and two phase simplex method. Duality, dual Simplex method. **(9)**

UNIT III: TRANSPORTATION PROBLEM AND ASSIGNMENT PROBLEM

Transportation problem: definition and algorithm, transshipment problem. Assignment problem, travelling salesman problem. **(9)**

UNIT IV: DYNAMIC PROGRAMMING

Introduction, developing optimal decision policy, Dynamic Programming Problem (DPP) under certainty, DPP approach for solving LPP. **(9)**

UNIT V: PROJECTMANAGEMENTAND QUEUINGMODELS

Network analysis: Network representation, Critical Path Method (CPM) and Project Evolutionary and Review Technique (PERT). Introduction to queuing system, single server queuing models (M/M/1) :(∞/FCFS), (M/M/1): (N/FCFS). **(9)**

Course outcomes:

At the end of the course the students should able to

1. Understood the importance of unconstrained and constrained optimization to solve engineering problems.
2. Get an idea about the linear programming techniques.
3. Solve transportation andassignment problems in engineering situations.
4. Applythe Bellman principle of optimality to solvedynamic programming problem.
5. Analyze the problems of network analysis for project management and Queuing systems engineering & industry.

Text Books:

1. J K Sharma, Operations Research: Theory and Practice, Macmillan Publishers India Ltd, 5^{th} edition,2013.
2. B.S. Grewal, Higher Engineering Mathematics, 43^{rd} edition (2014), Khanna publishers.

References:

1. Hamdy A Taha, Operations Research: An Introduction, Pearson Education, 9/E, 2011.
2. FS Hillier and GJ Lieberman, Introduction to Operations Research, TMH, 8/E, 2006.
3. JC Pant, Introduction to Optimization: Operations Research, Jain Brothers, New, 6/E, 2004.
4. A Ravindran, DT Philips and JJ Solberg, Operations Research: Principles and Practice, John Wiley& Sons, Singapore, 2^{nd}edition.

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

Dept. of Computer Science & Technology

Open Elective - II

18PHY301 OPTICAL PHYSICS AND ITS APPLICATIONS

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description:

The course will cover Geometrical optics, Aberrations, Physical Optics, Diffraction and Optical fibers.

Course Objectives:

1. Knowledge of basic principles and concepts in optics and the techniques used to deal with them.
2. Explain the limitations associated with spherical and chromatic aberration
3. Describe optical systems such as microscopes and telescopes with reference to parameters such as angular magnification and depth of field
4. Provide students with a working knowledge of optical physics, including interference, diffraction and physical optics.
5. Introduce construction and concepts of basic fiber optic communication system and to make the students learn about its important applications for societal needs.

UNIT I: INTRODUCTION

Corpuscular and wave theory, Fermat's principle, Matrices for translation, refraction and reflection, Unit and nodal planes, Eigenvalues and Eigenvectors. **(9)**

UNIT II: ABERRATIONS AND OPTICAL INSTRUMENTS

Types of aberrations, Chromatic and monochromatic aberrations. Different types of monochromatic aberrations. Simple and Compound microscopes, Astronomical and Terrestrial telescopes. Ramsden's and Huygens' eye pieces. **(9)**

UNIT III: WAVE OPTICS & INTERFERENCE

Huygens's principle, Superposition of waves, Fourier transforms, representation of slits and apertures, Two beam interference by Division of wave front. Applications of Interference, Nonlinear interaction of light with matter (self-study). **(9)**

UNIT IV: DIFFRACTION & POLARISATION

Fraunhoffer diffraction, Diffraction from single slit, double slit & multiple slits, Fresnel half-period zones, Zone plate, Applications of diffraction, Polarization, Malus' law, double refraction. Applications of polarization. **(9)**

UNIT V: FIBER OPTICS

Construction and working principle of optical fibers, Numerical aperture and acceptance angle, Types of optical fibers. Attenuation and losses in optical fibers, Analog and Digital optical fiber communication system. Applications of optical fibers in communications, sensors and medicine.

(9)

Course Outcomes:

Upon completion of this course the students shall be able to:

1. Recollect the fundamental characteristics of light and their mathematical principles.
2. Learn the principles of superposition, Interference and Diffraction
3. Understand nonlinear optics and photonics phenomena.
4. Be exposed to the application of optical techniques in cutting edge research areas.
5. Describe the basic laser physics, working of lasers and principle of propagation of light in optical fibers.

Text Book:

1. Optics by Ghatak, 4th Edition, Tata McGraw Hill (2011).

Reference Books:

1. Optics by Lipson, Lipson & Lipson, 4th Edition, Cambridge Univ Press (2010).
2. Optics by Hecht, 4th Edition, Addison-Wesley (2002).

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Open Elective - II

18PHY302 LASER PHYSICS AND ADVANCED LASER TECHNOLOGY

L	T	P	C
3	0	0	3

Course Prerequisite: Basic knowledge of atomic structure at intermediate (10+2) level is sufficient

Course Description:
Laser usage is rampant in various technological applications. Several fields gaining attention in the usage of lasers. This course covers the introduction to the theory and mechanism of laser action, various types of lasers and their applications and future use.

Course Objectives:
1. Make the student to understand the detailed principles of various lasers.
2. Profound understanding of different variety of lasers will provide them to think of superior selection and usage of lasers in practical technological applications.
3. Students are aware of latest developments in certain areas of Laser technology which have important applications for societal needs.
4. Explain how material processing is accomplished with lasers. Estimate laser operation parameters for material processing.
5. Exposure about Lasers applications in engineering, communications, spectroscopy and material process etc.

UNIT I: INTRODUCTION TO LASER TECHNOLOGY
Laser characteristics, The Einstein Coefficients, Absorption and Emission Cross Sections, Spontaneous and Stimulated emission of radiation, Population inversion, Methods of Population Inversion, Laser Rate Equations, stable two minor optical resonators, Mode selection, Gain in the regenerative laser cavity. **(9)**

UNIT II: GASES AND LIQUIDS LASING MEDIUM
Energy levels & Radiative properties of Atoms and molecules**;** *Atomic lasers*: He-Ne laser, Argon Ion laser**;** *Molecular Lasers*: Carbon dioxide laser, Liquid energy levels and their radiative properties, Organic Dye laser. **(9)**

UNIT III: SOLID STATE LASERS
Energy Levels in solids-dielectric medium, Solid-state lasing materials, Narrow line width laser materials, broad band line width laser materials, solid state lasers: Nd:YAG, Nd:YLF; Ti:Sapphire (introduction only) Energy Levels in solids-semiconductor medium, direct and indirect band gap semiconductors, Semiconductor diode laser, Quantum dot lasers (Introduction only) **(9)**

UNIT IV: PULSED OPERATION OF LASERS
Nanosecond: Q-Switching, Techniques of Q-Switching: electro-optic, Acousto-Optic. Femtosecond: Relationship between pulse duration and Spectral Width, Passive mode-locking, Active mode locking, Kerr lens mode locking, Amplification of femtosecond pulses. **(9)**

UNIT V: LASER APPLICATIONS
Laser processing of materials: laser cutting, laser drilling, welding; Lasers in metrology- Accurate measurement of length, light wave communications; Laser spectroscopy: Laser fluorescence and Raman scattering **(9)**

Course Outcomes
Upon completion of this course the students shall be able to:

1. Understand the principle of phenomenon of laser and identify the operating principle involved in various type of lasers.
2. Estimate stability requirements in producing laser light by different types of sources
3. Differentiate or list the various types of lasers and their means of excitation.
4. Assess (Identify) which laser would best meet the need for a particular industrial or research task.
5. Student can knowledge of latest technological developments in laser technology. Femtosecond laser etc.

Text books:

1. Laser Fundamentals: William T Silfvast. Cambridge Publication.
2. Laser Theory and Applications: A.K. Ghatak and K. Thyagarajan, Springer

Reference books:

1. Solid State Laser Engineering: Walter Koechner. Springer series in optical sciences.
2. Ultrafast Optics, Andrew M. Weiner
3. Laser spectroscopy: Demtroder
4. Laser Applications: Monte Ross
5. Femtosecond Laser Pulses Principles and Experiments: Claude Rulli`ere, Springer
6. Principles of Laser: O. Svelto
7. Laser Physics: Peter W Miloni, Joseph H Eberly.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Open Elective - II

18CHE301 INTRODUCTION TO PETROLEUM INDUSTRY

	L	T	P	C
Course Pre-requisite: Basic Chemistry at Intermediate or equivalent level.	**3**	**0**	**0**	**3**

Course Description:
It deals with basic principles of petroleum engineering and the processes involved in petroleum industry.

Course Objective:
1. To get exposure to the basic concepts of petroleum refining.
2. To understand the basic properties of various fuels, additives and their importance.
3. To introduce the basic concepts of refining processes and technologies.
4. To familiarize the basic concepts of catalysis and various catalysts used in the refinery.
5. To understand the safety and environmental issues in petroleum industry

UNIT I: BASIC PROCESSES IN PETROLEUM REFINING AND FUEL TESTING
Source of Crude oils and types, Overview of refinery process, Atmospheric Distillation, Vacuum distillation, Desalter, Desulphurization, Cracking, catalysis, Effluent treatment plant(ETP). Properties and quality control of fuel: Density, Viscosity, Pour Point, Flashpoint, Fire Point, Octane Number, Cetane Number, Ductility, Water Content, Sulphur Analysis, Micro Carbon Residue Test(MCRT), Saturate, Aromatic, Resin and Asphaltene(SARA), High Frequency Reciprocating Rig(HFRR), Calorific Value. **(9)**

UNIT II: CHEMICAL ADDITVES IN PETROLEUM INDUSTRY
Types of products in the refinery and their structural properties, Neutralizing amines, Corrosion inhibitors, Multifunctional additives, viscosity modifiers, drag reducing agents, antioxidants, Lubrication modifiers, Antifoam agents, Oil spill absorbers, Dispersants, Chemicals used for ETP plant. **(9)**

UNIT III: ROLE OF HYDROPROCESSING AND FLUID CATALYTIC CRACKING IN PETROLEUM INDUSTRY
Hydrocracking reactions, Hydrocracking feedstock's, Modes of Hydrocracking, Effects of process variables, Hydro treating process and catalysts, Resid hydro processing, FCC Cracking, Catalyst coking and regeneration, Design for Fluidized-Bed Catalytic Cracking Units **(9)**

UNIT IV: ROLE OF CATALYSTS AND BIOPROCESSES IN PETROLEUM INDUSTRY
Types of catalyst and their importance, Design and selection of catalyst. Catalytic processes. Bioprocesses: Introduction, Refining of petroleum using biodesulphurisation, Bioremediation, commercial processes for bioethanol, isopropanol. **(9)**

UNIT V: SAFETY AND MANAGEMENT IN PETROLEUM INDUSTRY
Safety policy, Personal protective equipment, Different type of extinguishers, Types of gloves and their application, Hydrants and their role, Safety indicators, Safety contact, Environmental pollution, precaution and first aid, safety measures, Different elements and their role in Occupational safety and Management. **(9)**

Course Outcomes:

At the end of the course, the students will

1. Be able to understand the overview of petroleum industry
2. Be able to understand the concepts of crude oil, types of crude oils, properties of fuels such as octane number, cetane number, viscosity, density etc. Instruments.
3. Be familiarized with importance and their use of chemicals involved in the petroleum industry.
4. Be familiarized with the processes involved in hydroprocessing and fluid catalytic cracking.
5. Be familiarized the types of catalysts and bioprocesses in the petroleum industry.
6. Understanding the PPE, different types of extinguishers, First aid, process safety and management in the petroleum industry.

TEXT BOOKS

1. Mohamed A. Fahim, Taher A. Al-Sahhaf and Amal Elkilani, Fundamentals of Petroleum Refining, Elsevier,2009

2. David T Day, Handbook of the Petroleum Industry, Volume 1, ISBN: 137595962X, Chizine Publ., 2017

REFERENCE BOOKS:

1. Sankara Papavinasam, Corrosion Control in the Oil and Gas Industry, Elsevier, 2013

2. Petroleum Engineering Handbook (Vol. 1 - VIII). Editor in Chief: Larry W. Lake, Society of Petroleum Engineers.

3. Srinivasan Chandrasekaran. Health, Safety and Environmental Management for offshore and Petroleum Engineers, John Wiley and Sons, U.K., ISBN: 978-11-192-2184-5, 2016.

4. S. P. Srivastava and Jenő Hancsók, Fuels and fuel additives, Wiley VCH Verlag Gmbh & Co, Weinheim, 2004.

5. Robert O. Anderson, Fundamentals of the Petroleum Industry–University of Oklahoma Pres, 1987.

6. James G. Speight, Handbook of Petroleum Product Analysis, John Wiley & Sons, Inc, 2015

7. Physical Chemistry by G.W. Castellan (Addison Wesley Publishing Company), 2004

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Open Elective - II

18CHE302 GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT

L	T	P	C
3	0	0	3

Course Prerequisite: Basic Engineering Chemistry or equivalent level

Course Description:
This course aims to introduce the interdisciplinary concept for engineering's to enhance their knowledge that they need to contribute with relevance and confidence in developing green technologies.
This course covers feedstocks, green metrics and the design of safer, more efficient processes, as well as the role catalysts, solvents and green processes for nanoscience.

Course Objectives:

1. Learn an interdisciplinary approach to the scientific and societal issues arising from industrial chemical production, including the facets of chemistry and environmental health sciences that can be integrated to promote green chemistry
2. Sensitize the students in redesigning of chemicals, industrial processes and products by means of catalysis.
3. Understand the use of alternatives assessments in using environmentally benign solvents.
4. Emphasize current emerging greener technologies and the need of alternative energies.
5. Learn to adopt green chemistry principles in practicing nanoscience.

UNIT I: PRINCIPLES AND CONCEPTS OF GREEN CHEMISTRY

Introduction, Green chemistry principles, sustainable development and green chemistry, atom economy, atom economic: Rearrangement and addition reactions and un-economic reactions: Substitution, Elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation. **(9)**

UNIT II: CATALYSIS AND GREEN CHEMISTRY

Introduction to catalysis, Heterogeneous catalysts: Basics of Heterogeneous Catalysis, Zeolites: Catalytic cracking, ZSM-5 catalyst and high silica zeolites, TS1 Oxidation catalyst, Catalytic Converters, Homogeneous catalysis: Hydrogenation of alkenes using Wilkinson's catalyst, Phase transfer catalysis: Hazard Reduction, C–C Bond Formation, Oxidation Using Hydrogen Peroxide. Recycling of catalyst. **(9)**

UNIT III: ORGANIC SOLVENTS: ENVIRONMENTALLY BENIGN SOLUTIONS

Organic solvents and volatile organic compounds, solvent free systems, supercritical fluids: carbondioxide, water - water as a reaction solvent, water based coatings, Ionic liquids as solvent.

(9)

UNIT 4: EMERGING GREENER TECHNOLOGIES AND ALTERNATIVE ENERGY SOURCES
Biomass as renewable resource, Energy: Fossil Fuels, Energy from Biomass, Solar Power, Fuel Cells (Hydrogen—oxygen fuel cell, SOFC and PEMFC), Photochemical Reactions: Advantages and Challenges of Photochemical Processes, Example-Caprolactum, chemistry Using Microwaves: heating, assisted Reactions, Sonochemistry **(9)**

UNIT 5: GREEN PROCESSES FOR NANOSCIENCE

Introduction and traditional methods in the nanomaterials synthesis, Translating green chemistry principles for practicing nanoscience. Green Synthesis of Nanophase Inorganic Materials and Metal Oxide Nanoparticles: Hydrothermal Synthesis, Reflux Synthesis, Microwave-Assisted Synthesis, Other methods for Green synthesis of metal and metal oxide nanoparticles, Green chemistry applications of Inorganic nanomaterials **(9)**

Course Outcomes:

Upon completion of this course the students should

1. Recognize green chemistry concepts and apply these ideas to develop respect for the interconnectedness of our world and an ethic of environmental care and sustainability.
2. Understand and apply catalysis for developing ecofriendly processes.
3. Be in a position to use environmental benign solvents where ever possible.
4. Have knowledge of current trends in alternative energy sources.
5. Apply green chemistry principles in practicing green Nanoscience.

Text Books:

1. M. Lancaster, Green Chemistry an introductory text, Royal Society of Chemistry, 2002.
2. Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, 4th Edition, Oxford University Press, USA 2005.

Reference Books:

1. Edited by Alvise Perosa and Maurizio Selva , Hand Book of Green chemistry Volume 8: Nanoscience, wiley-VCH
2. V.K. Ahluwalia , M. Kidwai, New trends in Green chemistry, 2004, Springer.
3. Benny Joseph, Environmental Science and Engineering, TATA Mc Graw Hill, New Delhi 2006.
4. Albert Matlack, Introduction to Green Chemistry, Second Edition CRC press, 2010

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Open Elective - II

18HUM301 INTELLECTUAL PROPERTY RIGHTS

L	T	P	C
3	0	0	3

Course Description: Intellectual property (IP) is a legal term that refers to creations of the mind. Examples of intellectual property include music, literature, and other artistic works; discoveries and inventions; and words, phrases, symbols, and designs. Under intellectual property laws, owners of intellectual property are granted certain exclusive rights. Some common types of intellectual property rights (IPR) are copyright, patents, and industrial design rights; and the rights that protect trademarks, trade dress, and in some jurisdictions trade secrets. Intellectual property rights are themselves a form of property, called intangible property.

Course Objectives:

The course is intended to:

1.Explain the importance of Intellectual Property Rights, its protection and management;

2.Explain the types/tools of IPR;

3.Make aware the students to understand the commercialization of IPR;

4.Know the filing of patent rights, acts, rules & portfolio analysis, management, patent strategy; and

5.Create awareness about Right to Information Act (RTI), its powers, functions, penalties and appeal.

UNIT I: INTRODUCTION:

Intellectual property and its protection, WTO, TRIPS Agreement& its Protection

(9)

UNIT II: INTRODUCTION TO COPYRIGHTS

Copyright Principles – Copyright Law - Copyright ownership - Right to prepare derivative works – Rights of Distribution - Copyright Formalities and Registrations - Copyright disputes - International Copyright Law – Patent Trademark – Geographical indications

(9)

UNIT III: COMMERCIALIZATION OF IP ASSETS:

Contracting, Licensing, Assignment and technology transfer; Drawing up a business strategy IP rights in export markets; Ownership of rights by employees; Valuation of intellectual property rights. **(9)**

UNIT IV: PROCEDURE FOR FILING PATENT IN INDIA AND OTHER COUNTRIES,

PCT filing, Patent Search, Patent Acts & Rules, Patent Infringement, Patent Portfolio analysis and management, Patent Strategy. **(9)**

UNIT V: RTI

Introduction – Objectives – Obligation of Public Authorities – The Central & State information commission – Powers & Functions – Penalties & Appeal. **(9)**

Dept. of Computer Science & Technology

Course Outcomes:

At the end of the course, students will be able to

1. Understand the importance of Intellectual Property Rights, its protection and management.
2. Analyze and apply the types/tools of IPR.
3. Identify the process of commercialization of IPR.
4. Understand the procedure of filing of patent, acts, rules and portfolio analysis, management, patent strategy.
5. Apply the Right to Information Act (RTI) in real life situation.

Text Book:

1. Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets, 4th Edition (2013) By **Deborah E. Bouchoux, Cengage Learning**

References:

1. Latest Research Papers

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Open Elective - II

18HUM302 HUMAN RESOURCE DEVELOPMENT

L	T	P	C
3	0	0	3

Course Description: The course content includes: Introduction to HRM, strategic human resource challenges, work flows, job analysis, managing diversity, concepts, goals, mechanism and system of HRD, recruitment and selection, downsizing and outplacement, appraising and managing employee performance, training, career development, managing compensation, rewarding performance, designing benefit plans, employee relation and employee discipline, and workplace safety and health.

Course Objectives: The course is intended to:

1. Explain the nature and scope of HRM, its functions, policies and strategies;
2. Describe the human resource planning, work analysis and importance in designing jobs;
3. Know the recruitment, selection and the process of performance appraisal;
4. Make the student to learn about training and development; and
5. Explain the industrial relations, trade unions, Ethics and fair treatment at work.

UNIT I: INTRODUCTION

Understanding the nature and scope of Human Resource Management- Definition, Functions objectives, organization of department.

(9)

UNIT II: HUMAN RESOURCE PLANNING

Human Resource Planning- Factors affecting HRP, the planning process, managerial succession planning. Job Analysis, Methods of collecting job data, Competency based Job Analysis, Job design approach, contemporary issues in Job Description.

(9)

UNIT III: RECRUITMENT, SELECTION AND PERFORMANCE APPRAISAL

Recruiting and selecting employees-, Selection process, Barriers, selection in India. Performance Management, Process of Performance Appraisal, Methods of Performance Appraisal - Errors in Performance Appraisal.

(9)

UNIT IV: TRAINING AND DEVELOPMENT

Training v/s development – Training Methods - challenges in training - Career development – Reward Management – Performance Appraisal – Compensation Management.

(9)

UNIT V: INDUSTRIAL RELATIONS, TRADE UNIONS

Industrial Relations, Trade unions, resolving dispute- Labor Movement - Trade Union in India, Collective Bargaining: Process and Methods, Grievance: Sources and process of Redressal, Managing Ethical issues in Human Resource Management- Ethics and fair treatment at work.

(9)

Course Outcomes:

At the end of the course, students will be able to:

1. Understand the concept of HRM, its nature, scope, functions, policies and strategies;
2. Analyse human resource planning and apply in designing jobs;
3. Evaluate the recruitment, selection and the process of performance appraisal;
4. Understand the importance of training and development activities; and
5. Examine the industrial relations, trade unions, employee safety and health measures.

Text Books:

1. Aswathappa K., Human Resource Management- Text and Cases, Tata McGraw Hill, 6th Edition, 2010
2. Gomez-Mejia, L.R., Balkin, D.B., &Cardy, R.L. Managing Human Resource Management 6th edition, Pearson Edu. 2007.

References:

1. Garry Dessler, BijuVarkkey , Human Resource Management ,11th Edition, Pearson Education, 2009.
2. R. Wayne Mondy, Human Resource Management, 10th Edition, 2010

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Open Elective - II

18CE301 GROUND IMPROVEMENT TECHNIQUES

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

Identification of problematic soils; ground improvement techniques; densification in granular soils; densification in cohesive soils; soil stabilization; confinement; reinforced earth; geosynthetics; improvement of expansive soils.

Course Objectives

1. To introduce engineering properties of soft, weak and compressible deposits, principles of treatment for granular and cohesive soils and various stabilization techniques.
2. To bring out concepts of reinforced earth.
3. Applications of geotextiles in various civil engineering projects.

UNIT I: DEWATERING & GROUTINHG

Introduction- Need for engineered ground improvement, classification of ground modification techniques; suitability, feasibility and desirability of ground improvement technique. Methods of de-watering- sumps and interceptor ditches- wells- drains- Electro- osmosis. Objectives of grouting- grouts and their properties-grouting methods. **(9)**

UNIT II: DENSIFICATION

In - situ densification methods in cohesionless Soils: - Vibration at the ground surface, Impact at the Ground Surface, Vibration at depth, Impact at depth. In - situ densification methods in cohesive soils: - preloading or dewatering, Vertical drains - Sand Drains- Sand wick geo-drains - Stone and lime columns - thermal methods. **(9)**

UNIT III: STABILIZATION

Methods of stabilization-mechanical-cement- lime-bituminous-chemical stabilization with calcium chloride- sodium silicate and gypsum. **(9)**

UNIT IV: REINFORCED EARTH & GEOSYNTHETICS

Principles - Components of reinforced earth - factors governing design of reinforced earth walls design principles of reinforced earth walls. Geotextiles- Types, Functions and applications - geo- grids and geo-membranes - functions and applications. **(9)**

UNIT V: EXPANSIVE SOILS

Problems of expansive soils - tests for identification - methods of determination of swell pressure. Improvement of expansive soils - Foundation techniques in expansive soils - under reamedpiles. **(9)**

Course Outcomes

After successful completion of the course, student will be able to

1. Identify basic deficiencies of various soil deposits and able to decide various dewatering methods to improve the soil.
2. Implement different techniques of soil densification.
3. Use admixtures in stabilizing the soil.
4. Use geo-synthetics materials in engineering applications.
5. Suggest different types of foundation techniques and methods to control swelling of soil

Text Books

1. Dr. Purushotham Raj, P., Ground Improvement Techniques, Laxmi Publications, New Delhi.
2. Dr. Sivakumar Babu, GL, An Introduction to Soil Reinforcement & Geosynthetics, Universities Press

Reference Books

1. Hausmann M.R., Engineering Principles of Ground Modification, McGraw-Hill International Edition, 1990.
2. Moseley M.P., Ground Improvement, Blackie Academic and Professional, Boca Taton, Florida, USA, 1993.
3. Xanthakos P.P., Abramson, L.W and Brucwe, D.A., Ground Control and Improvement, John Wiley and Sons, New York, USA, 1994.
4. Robert M. Koerner, Designing with Geosynthetics, Prentice Hall New Jercy, USA.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Open Elective II

18HUM304 NATIONAL CADET CORPS

L	T	P	C
3	0	0	3

Pre-requisite: NCC B-Certificate

Course Description:
The main aim of this course is to mould the youth into responsible citizens of the nation. It helps to improve character and leadership qualities towards nation building. This course also motivates the youth to offer Selfless service to the society and nation. The course comprises Common subjects, Service subjects of NCC, societal aspects and basic organization of Indian Armed Forces.

Course Objectives:
This course enables the student to –

1. Get aware of NCC organization and general structure of Defence Forces.
2. Learn leadership and national integration.
3. Motivate towards to maintain Health and hygiene, personality development.
4. Learn elementary characteristics of disaster management, Field craft and Battle craft.
5. Acknowledge the Social activities, Communication and Military History.

UNIT I **10 hours**

INTRODUCTION TO NCC
Introduction, History of NCC , NCC Motto, NCC Flag, Aims of NCC, Cardinal points of NCC, Organization of defence forces in general, Organizational structure of Indian Army(Armed forces), Organizational structure of NCC, NCC Song, Incentives of NCC, Ranks in Army, Navy and Air Force, current representatives – Certificate Examination in NCC– Honours and Awards.

FOOT DRILL BASICS
Aims of Drill, Word of Commands, Attention, Stand at Ease, Turning Left, Right and Inclining at the Halt. Sizing, Forming up in three Ranks and Numbering, Open and Close March Order, Dressing the Squad, Saluting at the Halt, Getting on Parade, Falling Out and Dismissing, Marching, Guard of Honour.

UNIT II **10 hours**

LEADERSHIP
Meaning, Leadership Traits, Types of Leadership, Discipline & Duty of an Indian Citizen, Motivation, Code of Ethics, Perception, Communication, Customs of Services, Importance of Team Work, leaders(swami Vivekananda).

NATIONAL INTEGRATION
Meaning and Importance, Unity in Diversity, Indian History and Culture, Religion and Customs of India, India and its Neighbours, Contribution of Youth in Nation Building, Contribution of leaders in nation unification .

UNIT III **12 hours**

HEALTH AND HYGIENE

Structure and Function of Human Body, Hygiene and Sanitation, Preventable Diseases, First Aid, Yoga: Introduction and Exercises, Physical and Mental Health, Fractures: Types and Treatment.

PERSONALITY DEVELOPMENT

Introduction to personality development, Physical and social factors influencing / shaping personality, psychological and philosophical factors influencing / shaping personality, Self-awareness, SWOT analysis, mind set, interpersonal relationship and communication, effective communication, barriers of communication.

ENVIRONMENT AND ECOLOGY

Environment: Meaning, Global Warming, Acid Rain, Depletion of Ozone Layer, Conservation of Environment. Ecology: Introduction, Component of Ecological System, Forest Ecology, Wild Life, Pollution Control.

UNIT IV **10 hours**

DEFENCE AND DISASTER MANAGEMENT

Civil Defence: Meaning, Organization and its Duties, Civil Defence Services, Fire Fighting : Meaning, Mode of Fire, Fire Fighting Parties, Fire Fighting Equipment. Introduction, Classification of Disaster: Natural Disaster & Man Made Disaster, Disaster Management During Flood, Cyclone and Earth Quake, Assistance in Removal of Debris, Collection and Distribution of Aid Material, Message Services.

SOCIAL SERVICE ACTIVITIES (Social Service And Community Development)

Basics of Social Service, Weaker Sections in the Society and its Identification, Contribution of Youth towards Social Welfare, NGOs and their Role and Contribution , Social Evils, Drug Abuse, Family Planning, Corruption, Counter Terrorism, Eradication of Illiteracy – Aids Awareness programme – Cancer Awareness Programme.

UNIT V **10 hours**

COMMUNICATION

Types of communication, characteristics of wireless technology, Walkie/talkie, Basic RT procedure, Latest trends and development(Multimedia, video conferencing, IT)

MILITARY HISTORY

Biography of Indian Historical Leaders: Chatrapati Shivaji, Maharana Pratap, Akbar Famous Battles / Wars of India: Indo – Pak War 1971(all wars), Kargil War.(Categorise: before/ After independence)
Biography of Successful Leaders: General Patton, General Mac. Arthur, Field Marshal Sam Maneksha.

Course Outcomes:

At the end of the course, students will be able to:

1. Analyse the NCC structure and different ranks in Indian Armed Forces along with foot drill.
2. Notify the leadership traits and the need of national integrity towards nation building.
3. Instill respect and responsibility towards personal health and hygiene, develop dynamic personality with adequate qualities.
4. Identify different disasters and judging measurements on the ground.
5. Recognise various communication devices, analyse the Military Organization.

Text Books:

1. HAND BOOK OF NCC – “SANJAY KUMAR MISHRA, MAJOR RC MISHRA”, published by Kanti prakashan-2020.
2. NCC HAND BOOK - “SHASHI RANJAN & ASHISH KUMAR”, published by Goodwin Publications-2021.

Reference Books:

1. NCC Hand book – “R.Gupta’s”, Ramesh Publishing House-2021.
2 NCC (ARMY WING)- “R.Guptas’s”,RPH Editorial Board-2021
3 Hand Book Of N.C.C. – “Ashok Pandey”, Kanti Publications-2017

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

Open Elective - II

18CE302 ENVIRONMENTAL IMPACT ASSESSMENT

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

The course will focus on Basic concept of Environmental Impact Assessment (EIA), EIA Methodologies, Impactof Developmental Activities and Land use in soil, water, and vegetation, Environmental Audit, Post Audit activities, The Environmental pollution Acts.

Course Objectives

1. To impart knowledge on Environmental management and Environmental Impact Assessment.
2. To give the student the brief knowledge about various legislations and audit protocols.
3. To give student knowledge about the framing of environmental audit through case studies.

UNIT I: CONCEPTS AND METHODOLOGIES IN EIA

Introduction - Elements of EIA - Factor affecting EIA -Impact evaluation and analysis - Preparation of Environmental Base map - Classification of environmental parameters. Criteria for the selection of EIA Methodology - EIA methods: Ad-hoc methods - matrix methods - Network method - Environmental Media Quality Index Method -overlay methods - cost/benefit Analysis. **(9)**

UNIT II: IMPACT OF DEVELOPMENTAL ACTIVITIES

Introduction and Methodology for the assessment of soil and ground water - Delineation of study area - Identification of actives. Procurement of relevant soil quality - Impact prediction - Assessment of Impact significance -Identification and Incorporation of mitigation measures. EIA in surface water - Air and Biological environment. **(9)**

UNIT III: IMPACT ON VEGETATION AND WILD LIFE

Assessment of Impact of development Activities on Vegetation and wildlife - environmental Impact of Deforestation - Causes and effects of deforestation. **(9)**

UNIT IV: ENVIRONMENTAL AUDIT

Environmental Audit & Environmental legislation objectives of Environmental Audit - Types of environmental Audit - Audit protocol - stages of Environmental Audit - onsite activities - evaluation of audit data and preparation of audit report - Post Audit activities. **(9)**

UNIT V: ENVIRONMENTAL POLLUTION ACTS

The water Act-1974 - The Air Act-1981 (Prevention & Control of pollution Act.) - Wild life Act- 1972 - Indian Forest Conservation Act-1980 -National Green Tribunal Act –2010 - Biological Diversity Act-2002. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Utilize the various methods used in predicting environmental impacts.
2. Utilize site information to interpret impacts on land and groundwater.
3. Outline the environmental impacts of various development activities on existing ecosystem.
4. Utilize the procedures and various protocols involved in preparation of environmental audit report.
5. Utilize the implications of environmental prevention and protection acts in relation to environmental impact assessment.

Text Books

1. Anjaneyulu, Y., Environmental Impact Assessment Methodologies, B.S. Publication, Sultan Bazar, Kakinada.

Reference Books

1. Glynn, J. and Gary W. Hein Ke., Environmental Science and Engineering, Prentice Hall Publishers
2. Suresh K. Dhaneja Environmental Science and Engineering, S.K., Katania& Sons Publication, New Delhi.
3. Dr. Bhatia, H.S., Environmental Pollution and Control, Galgotia Publication (P) Ltd, Delhi.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Open Elective - II

18CE303 WATERSHED MANAGEMENT

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

Topic covers basic concepts of watershed, sustainable watershed management approached and practices, integrated watershed management and modelling, social aspect in watershed management, quantification of water quality and quantity at the catchment outlet using modern techniques, drought, flood and storm management at catchment scale.

Course Objectives

1. To discuss various aspects of water resources development and management on watershed basis.
2. To proliferate the sustainable use and development of natural resources.
3. To enrich the students for change in the hydrological fluxes due altered physiographic condition (land use or elevation) on a watershed scale.
4. To improve the quantitative problem solving skills of the students for natural resources management.

UNIT I

CONCEPT OF WATERSHED: Concept of watershed - classification of watershed - introduction to watershed management - objective of watershed development - Hydrological cycle - water balance equation - different stakeholders and their relative importance - watershed management policies and decision making.

FACTOR AFFECTING WATERSHED DEVELOPMENT: Morphological characteristics: linear - Arial and Relief aspect - land use - vegetation - soil and geological characteristics - Hydrology and geology and socio-economic characteristics. **(9)**

UNIT II

WATERSHED MODELING: Watershed delineation - modelling of rainfall - runoff process - Concept of integrated watershed management conjunctive use of water resources - Integrated water resources management. PRA - Private sector participation - Institutional issues - Socio-economy issues - Integrated development - Water legislation and implementations - Tools and emerging technologies for watershed management and planning. **(9)**

UNIT III

EROSION AND SEDIMENTATION: Types of erosion - factor affecting erosion - effect of erosion on land fertility and capacity - estimation of soil loss due to erosion: universal soil loss equation.

PREVENTION AND CONTROL TO EROSION: contour techniques - ploughing - furrowing- trenching - bunding - terracing - gully control - rockfill dams - check dams - brushwood dam - Gabion structure. **(9)**

UNIT IV

WATER HARVESTING: Rain water harvesting - catchment harvesting - harvesting structures - soil moisture conservation - check dams - artificial recharge from pond - percolation tanks.

FLOOD AND DROUGHT MANAGEMENT: Definition of flood - Flood frequency analysis: Weibul - Gumbel - and log Pearson methods.Definition and classification of drought - drought analysis techniques - drought mitigation planning.

MANAGEMENT OF WATER QUALITY: Water quality and pollution - types and Sources of pollution - water quality modeling - environmental guidelines for water quality. **(9)**

UNIT V

COVER MANAGEMENT: Land use land cover change estimation through satellite imageries land capability classification - management of forest - agricultural - grassland and wild land - Reclamation of saline and alkaline soil. Classification of columns based on slenderness ratio - reinforcement & loading - Design of rectangular and circular columns subjected to axial load - (axial load + uni-axial bending) and (axial load + bi-axial bending). Different Types of Footings - Design of isolated - square - rectangular and circular footings.

INTEGRATED CROPPING SYSTEM FOR WATERSHEDS: Intercropping - mix cropping strip and terrace cropping - sustainable agriculture - cover cropping (biomass conservation) - horticulture - dryland agriculture and afforestation. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Classify watershed and Identify factors to consider for watershed Development.
2. Apply the concepts of watershed development and planning
3. Evaluate the erosion rate and total amount of soil loss from a watershed
4. Select the flood and drought mitigation measures
5. Quantify the change in land use land/cover and its impact on hydrological processes.

Text Books

1. Kenneth N. Brooks Peter F. Ffolliott Joseph A. Magner. Hydrology and the Management of Watersheds. A John Wiley & Sons, Inc., Publication (4^{th} Edition)
2. VVN, Murthy. Land and Water Management- Kalyani Pblication

Reference Books

1. JVS Murthy. Watershed Management. New Age International publisher.
2. A.M. Michel and T.P. Ojha. Hand Book on Agricultural Engineering, Volume 2.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Open Elective - II

18ME301 MATERIAL SCIENCE FOR ENGINEERS

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description:
The purpose of this course is to introduce the student to enrich their knowledge on the materials science field. Begin with the microscopic level the structure at the atomic and their impact on the material properties are discussed. Electronic and related conductivity of materials and respective origins are studied. Substantial part of this course is dedicated in study of magnetism and its origin in the materials along with suitable applications. Last unit is dedicated towards photonic materials.

Course Objectives:
1. To understand the relation between structure and properties of metallic materials.
2. To understand the strengthening mechanism of metals
3. To comprehend the various electrical and electronic properties of materials.
4. To understand origins and various types of magnetism and its applications.
5. To comprehend the transmission of light in various solids and study of photonic behavior.

UNIT I: STRUCTURE OF MATERIALS
Introduction: Historical prospective - importance of materials - Classification of Materials and its Properties. Bonding in solids: bonding forces and energies - primary and secondary bonding.
Crystallography and Metallic structures: Unit cell - Crystallographic directions and planes, FCC, BCC, HCP, SC and other structure – miller indices, Linear and planar densities - close-packed crystal structures. Packing of atoms in solids. Packing factor **(9)**

UNIT II: CRYSTAL IMPERFECTIONS AND DIFFUSION.
Crystal Imperfections: Types, Vacancies and interstitials, Dislocations and grain boundaries. Diffusion: Fick's Law of diffusion – Diffusion mechanism – Steady state and non-steady state, factors affecting diffusion. **(9)**

UNIT III: ELECTRICAL PROPERTIES OF MATERIALS
Introduction and Electrical Conduction: Ohm's Law, Electrical Conductivity, Electronic and Ionic Conduction, Energy Band Structures in Solids, Electron Mobility, Electrical Resistivity of Metals
Semiconductivity: Intrinsic and Extrinsic Semiconduction, Temperature Dependence of Carrier Concentration, Factors that Affect Carrier Mobility, The Hall Effect, Semiconductor Devices. Conduction in Ionic Materials, Electrical Properties of Polymers. Dielectric Materials: Capacitance, Ferroelectric Materials, Piezoelectric Materials. **(9)**

UNIT IV: MAGNETIC PROPERTIES OF MATERIALS
Introduction and Basic Concepts, Diamagnetism, Paramagnetism, Ferromagnetism, Antiferromagnetism, Ferrimagnetism, Influence of Temperature on Magnetic Behavior, Domains and Hysteresis, Magnetic Anisotropy, Soft and Hard Magnetic Materials, Magnetic Storage, Superconductivity. **(9)**

UNIT V: PHOTONIC MATERIALS
Introduction, Electronic Radiation in Vacuum; Reflection, Refraction and absorption in materials; Absorption and Chemical Bonding: Color, X-Ray absorption, Photon absorption Devices.
Photon Emission: X-Ray Emission, Emission of electromagnetic radiation and devices: LED's, OLEDs and LASERs. Optical Fibers in communication **(9)**

Course Outcomes:

At the end of the course students will be able:

1. To develop deep knowledge of crystal structure and effect of structure on the properties of the materials.
2. To demonstrate knowledge of various imperfections in crystal, and diffusion mechanism in materials.
3. To explain the origins of various electronic and electrical properties in the materials.
4. To understand the concept of magnetism, its origin and types, while choosing the right material for the given application.
5. To summarize various optical properties of the material and light's transmission behavior.

Text Books:

1. W. Callister, "Materials Science and Engineering", Wiley, 7th Edition, 2007.
2. Charles M. Gilmore, "Materials Science and Engineering Properties", Cengage Learning, SI Edition, 2016.

References:

1. Donald R. Askeland, Pradeep P. Phule, "The Science and Engineering of Materials", Cengage Learning, 5th Edition, 2006.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Open Elective - II

18ME302 ELEMENTS OF MECHANICAL ENGINEERING

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description:

Course Objectives:

Students belonging to all branches of Engineering are made to learn following fundamental topics related to mechanical engineering

1. To teach students the basic concepts of Thermodynamics.
2. To teach students the basic Classification and working principles of boilers and turbines.
3. To teach students about IC engines, Refrigeration, and Air-Conditioning systems.
4. To teach students about engineering materials and casting manufacturing processes.
5. To teach students and machines tools and manufacturing systems.

UNIT I:

Basic concepts of Thermodynamics: Introduction, Important terminologies used in thermodynamics, Specific heat capacity, First law of thermodynamics, Second law of thermodynamics, Reversible and irreversible processes, the Carnot cycle and the Clausius inequality. **(9)**

UNIT II:

Boilers: Introduction to boilers, Classification of boilers, requirements of a good boiler, Cochran, Babcock, Locomotive, and Lancashire boilers.

Turbines: Hydraulic Turbines-Classification and specification, Principles and operation of Pelton wheel turbine, Francis turbine, and Kaplan turbine (elementary treatment only).

Hydraulic Pumps: Introduction, Classification, and specification of pumps, reciprocating pump, and centrifugal pump. **(9)**

UNIT III:

Internal Combustion Engines

Classification, I.C. Engines parts, 2 and 4 stroke petrol and 4-stroke diesel engines, Working principle of IC engines, Valve timing diagrams, Otto cycle, Diesel cycle, and Dual cycle.

Refrigeration and Air conditioning Refrigeration – Introduction, Refrigerator, and Heat pump, Components of refrigeration system, Types of refrigeration system, and Type of refrigerants. **(9)**

UNIT IV:

Engineering Materials: Introduction, mechanical properties of engineering materials, mechanical testing of engineering materials, Impact test, and Classification of engineering materials.

Casting: Introduction to casting processes, Classification of casting processes, Sand casting, and special casting methods.

Power Transmission Devices: Introduction, belt drive, rope drive, Chain drive, Gear drive, Classification of gears. **(9)**

UNIT V:

Machine Tools: Introduction, Mechanism of metal cutting, Geometry of single point cutting tool, Orthogonal and oblique metal cutting, Lathe, and Milling machines.

Manufacturing Systems Introduction, Computer Integrated Manufacturing, CAD/CAM, Numerical Control (NC), Computer Numerical Control, and Dynamics Numerical Control. **(9)**

Course Outcomes:

On successful completion of the course, the student will be able to:

1. State first, second and third law of thermodynamics.
2. Sketch components of boilers and turbines.
3. State working principle of IC engines and R& AC systems.
4. Fair understanding of application and usage of various engineering materials, Casting process, and different types of drives with applications.
5. Explain the role of Computers in manufacturing systems.

Text Book:

1. "Basic Mechanical Engineering" by Pravin Kumar, Pearson Edition ISBN: 9789332505759, 9789332505759.

References:

1. George E Dieter, "Mechanical Metallurgy", 3rd Edition, McGraw Hill, 2017.
2. S. Kalpakjian and S. R. Schmid, "Manufacturing Engg, and Technology", 7th Edition, Pearson, 2018.
3. P K Nag, "Engineering Thermodynamics", 6th Edition, McGraw Hill, 2017.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Open Elective - II

18ME303 BASIC THERMODYNAMICS

L	T	P	C
3	0	0	3

Course Prerequisite: Differential Equations

Course Description:
Thermodynamics is one of the fundamental courses in the study of mechanical engineering. The principles of thermodynamics are applicable to a wide range of problems encountered in all branches of engineering. Also thermodynamics is an essential pre-requisite for subsequent courses in mechanical engineering like fluid mechanics, applied thermodynamics, heat transfer, gas dynamics, refrigeration and air conditioning, etc. This course is designed to equip the students with a thorough understanding of basic concepts of thermodynamics and with necessary skills and techniques to solve problems in thermodynamics through a systematic analysis using fundamental principles. The specific topics to be covered in the course include concepts of system and surroundings, energy, energy transfer by work and heat, properties of substances and property changes, first and second laws of thermodynamics.

Course Objectives:
1. To introduce the concepts of system, surroundings, energy interactions, thermodynamics properties of substances and to teach different techniques used for estimating the properties like gas laws and property tables
2. To explain the principles of work and energy.
3. To introduce the fundamentals of thermodynamic laws, concepts and principles.
4. To teach the systematic approach to be employed for effectively solving the problems in thermodynamics.
5. To explain the principles of various cycles and to apply the thermodynamic concepts in various applications like IC engines and Refrigeration and Air conditioning systems.

UNIT 1: THERMODYNAMIC BASICS
Macroscopic versus Microscopic viewpoint, Thermodynamic system and control volume, Thermodynamic properties, processes and cycles, Homogeneous and heterogeneous systems, Thermodynamic equilibrium, Quasi-static process, Concept of continuum, Zeroth law of thermodynamics, temperature scale, Ideal gas, Work Transfer, Heat transfer, First law of thermodynamics, Specific heat, Enthalpy, Internal Energy, Steady flow energy equation and application, PMM1 and Steady flow energy equation. **(9)**

UNIT 2: PROPERTIES OF PURE SUBSTANCES
Pure substance, Vapor-Liquid-Solid-Phase equilibrium in a pure substance, Independent properties of a pure substance, Phase boundaries, tables of thermodynamic properties, Thermodynamic Surfaces, p-v and p-T diagram for a pure substance, p-v-T surface, T-s and h-s or Mollier diagram for a pure substance, dryness fraction, Steam Tables, Charts of Thermodynamic properties, Measurement of steam quality. **(9)**

UNIT 3: SECOND LAW OF THERMODYNAMICS AND ENTROPY

Qualitative difference between heat and work, cyclic heat engine, Kelvin-Planck statement of second law, Clausius' statement of second law, Refrigerator and heat pump, Equivalence of Kelvin-Planck and Clausius statement, Reversibility and Irreversibility, Carnot cycle, Reversed heat engine, Carnot's Theorem, Corollary of Carnot's theorem, absolute thermodynamic temperature scale and Efficiency of heat engine, Entropy, Inequality of Clausius, Temperature-Entropy plot, Entropy generation in an open and closed system and Entropy change in an Irreversible process. **(9)**

UNIT 4: THERMODYNAMIC PROPERTY RELATIONS AND GAS MIXTURES

Equation of state, Ideal gas, Real gas, Compressibility chart, Internal energy, enthalpy, entropy, specific heats and Gibbs free energy of gas mixture, Maxwell's Equations, TdS equation, Difference in heat capacities, Ratio of heat capacities, Joule-Kelvin Effect, Clausius-Clapeyron equation, Properties of atmospheric air, Psychrometric chart and Psychrometric process. **(9)**

UNIT 5: THERMODYNAMIC CYCLES

Rankine cycle, Actual vapour cycle processes, Comparison of Rankine and Carnot cycles, Air standard cycles - Otto, Diesel, dual and Brayton cycles, Reversed heat engine cycle, Vapour compression refrigeration cycles. **(9)**

Course Outcomes:

On successful completion of the course, the student will be able to:

1. Define the fundamentals of the zeroth and first laws of thermodynamics and explain their application to a wide range of systems.
2. Apply the properties of steam to design steam systems.
3. Apply the second law of thermodynamics for the design of heat engine, heat pump and refrigerators. The student will also be able to Evaluate entropy changes in a wide range of processes and determine the reversibility or irreversibility of a process from such calculations.
4. Explain the cycles on which IC engines, Gas turbines and refrigerator works.
5. Explain the importance of Tds relations and be able to use psychometric charts for the design of air conditioning systems.

Text Books:

1. Cengel, Y.A and Boles, M.A, Thermodynamics: An Engineering Approach, 5th ed., McGraw-Hill, 2006.

References:

1. Sonntag, R.E., Borgnakke, C., and Van Wylen, G.J., Fundamentals of Thermodynamics, 6th ed., John Wiley, 2003.
2. Nag, P.K., Engineering Thermodynamics, 3rd ed., Tata McGraw-Hill, 2005.

Mode of Evaluation: Assignment, Mid Examination, End Examination

Open Elective - II

18EEE301 INDUSTRIAL ELECTRICAL SYSTEMS

L	T	P	C
3	0	0	3

Course Prerequisite: 18EEE101

Course Description:
This course deals with basics of electrical wiring systems for residential, commercial and industrial consumers, and its representation with standard symbols and drawings, various components of industrial electrical systems and its sizing and control aspects of industrial electrical system using PLC and SCADA.

Course Objectives:
1. To understand the electrical wiring systems for residential, commercial and industrial consumers.
2. To learn the representation of systems with standard symbols and drawings.
3. To understand the various components of industrial electrical systems.
4. To analyze and select the proper size of several electrical system components.
5. To study the control aspects of industrial electrical system using PLC and SCADA

UNIT I: ELECTRICAL SYSTEM COMPONENTS
LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices. **(9)**

UNIT II: RESIDENTIAL AND COMMERCIAL ELECTRICAL SYSTEMS
Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.
(8)

UNIT III: ILLUMINATION SYSTEMS
Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premises, flood lighting. **(8)**

UNIT IV: INDUSTRIAL SUBSTATION SYSTEMS
HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction – kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components. **(8)**

UNIT V: INDUSTRIAL SYSTEM AUTOMATION
DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks.
Study of basic PLC, Role of in automation, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation.
(12)

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Discuss the various component representation involved in the design of electrical wiring for Low Tension.
2. Understand the guidelines for wiring of household and commercial buildings.
3. Understand the various components of illumination in industrial electrical systems.
4. Select the proper size of various electrical system components required for designing different electrical wiring systems.
5. Understand the control aspects of industrial electrical system using PLC and SCADA.

Text Books:

1. S. L. Uppal and G. C. Garg, "Electrical Wiring, Estimating & Costing", Khanna publishers, 2008.
2. K. B. Raina, "Electrical Design, Estimating & Costing", New age International, 2007.

Reference:

1. Web site for IS Standards.
2. S. Singh and R. D. Singh, "Electrical estimating and costing", Dhanpat Rai and Co., 1997.
3. H. Joshi, "Residential Commercial and Industrial Systems", McGraw Hill Education, 2008.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

Open Elective - II

18EEE302 INTRODUCTION TO MEMS

L	T	P	C
3	0	0	3

Course Prerequisite: 18EEE101

Course Description:
This course describes about manufacturing, modeling and applications of MEMS.

Course Objectives:
1. To know the fundamentals of MEMS materials, their physical properties and Principles of operation of MEMS devices
2. To know various MEMS microfabrication technologies.
3. To provide various MEMS technology for mechanical, optical, and chemical sensors and actuator

UNIT I: INTRODUCTION
Overview – History and industry perspectives – Working principles – Mechanics and dynamics — Scaling law **(9)**

UNIT II: MICRO SENSORS & ACTUATORS
Micro sensors: Pressure sensors, accelerometers, gyroscopes-Micro actuators: comb drive actuators – Micro-electromechanical systems **(9)**

UNIT III: MICRO MANUFACTURING
Materials for MEMS and Microsystems- Micro fabrication processes: Photolithography, Ion Implantation, Diffusion, Oxidation, Chemical Vapour Deposition- Physical Vapour Deposition, Micro manufacturing: Bulk micromachining, surface micromachining, LIGA Process- Packaging. **(9)**

UNIT IV: MODELING IN MEMS
Micro system design: Finite Element Methods–– Modeling of simulation – piezoelectric, Gyroscope **(9)**

UNIT V: MEMS APPLICATIONS
Micro fluids-sensors for turbulence measurement and control, micro-actuators for flow control, RFMEMS- filters, Oscillators and phase shifters, Optical MEMS, micro robotics – Case studies **(9)**

Course Outcomes:
At the end of the course, students will able to
1. Explain the fundamentals of MEMS materials, their physical properties and Principles of operation of MEMS devices
2. Analyze the Micro sensors and actuators and its fabrication
3. Explain the materials for MEMS and Microsystems
4. Design MEMS using microfabrication techniques
5. Explain the advantages of MEMS technology for mechanical, optical, and chemical sensors and actuator

Text Books:

1. Chang Liu, 'Foundations of MEMS', Pearson Education Inc., 2006
2. G.K. Ananthsuresh et al ,'Micro and Smart Systems', Wiley, India, 2010

References:

1. NadimMaluf, "An introduction to Micro electro mechanical system design", ArtechHouse, 2000.
2. Mohamed Gad-el-Hak, editor, "The MEMS Handbook", CRC press Baco Raton, 2000
3. James J.Allen, micro electro mechanical system design, CRC Press published in 2005
4. Stephen D. Senturia, Microsystem Design, Kluwer Academic Publishers, 2001

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

Dept. of Computer Science & Technology

Open Elective - II

18ECE301 BIO-MEDICAL ELECTRONICS

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description:
This course provides the fundamental knowledge on applications of electronics in bio-medical signal measurements and processing, bio-medical instrumentation and imaging techniques.

Course Objectives:
This course enables students to
1. Acquire the basic knowledge on human physiology and biological transducers.
2. Learn about bio-electrodes and bio-amplifiers used in bio-signal acquisition.
3. Understand the working principle of bio-medical measuring instruments.
4. Study various types of imaging techniques used in medicine.
5. Learn the applications of medical instrumentation in designing artificial medical aids.

UNIT I: Human Physiology and Biomedical Transducers
Introduction to human physiology - Biomedical transducers for measuring displacement, velocity, force, acceleration, potential, dissolved ions and gases. **(9)**

UNIT II: Bio-Electrodes and Amplifiers
Introduction to bio-potential, Bio-electrodes, Typical waveforms and characteristics of ECG, EMG and EEG, Bio-potential amplifiers for ECG, EMG and EEG – Lead systems and recording methods. **(9)**

UNIT III: Biomedical Measuring Instruments
Measurement of blood pressure and temperature, Blood flow meter, Cardiac output measurement, Respiratory measurement, Blood cell counter, Impedance plethysmography. **(9)**

UNIT IV: Medical Imaging
X-ray, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Nuclear imaging, Ultrasonic Imaging. **(9)**

UNIT V: Prostheses and Aids
Pacemakers, Defibrillators, Heart-lung machine, artificial kidney, Aids for the handicapped, Safety aspects. (**9)**

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Understand the applications of biological transducers in medical field.
2. Analyze the design of bio-electrodes and bio-amplifiers.
3. Apply suitable measuring instruments to measure various medical parameters.
4. Understand and test various imaging techniques used in bio-medical diagnosis.
5. Analyze the applications of artificial medical aids.

Text Books

1. W.F. Ganong, Review of Medical Physiology, 26th Edition, Tata McGraw-Hill, New Delhi, 2019.
2. J.G. Websster, ed., Medical Instrumentation, 3rd Edition, Wiley India Pvt. Ltd. 2009.

Reference Books

1. A.M. Cook and J.G. Webster, eds., Medical Devices and Human Engineering, Taylor & Francis, 2014.
2. R.S.Khandpur, “Handbook of Biomedical Instrumentation”, 2nd edition, Tata McGraw-Hill, New Delhi, 2005.
3. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, Prentice-Hall, New Delhi, 2011.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Open Elective - II

18ECE302 VLSI DESIGN

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description

This course describes about various VLSI design methodologies, fundamentals of CMOS technology. It incorporates basics of MOSFET, CMOS processing technology, circuit characterization and performance estimation, combinational logic design, sequential logic design, logic families and VLSI Design flow.

Course Objectives

This course enables students to

1. Know the different VLSI Design Methodologies
2. Understand the characteristics of CMOS device
3. Study CMOS design rules
4. Designing of CMOS by considering the low power
5. Understand different types of CMOS circuit families

UNIT I: Introduction to VLSI design methodologies

Introduction to VLSI Design Methodologies, Scaling, CMOS Logic: Inverter, NAND Gate, NOR Gate, Combinational Logic, Compound Gates, Pass Transistors and Transmission Gates, CMOS Inverter Cross-section, Stick Diagrams. VLSI Design Flow, Complementary CMOS Inverter DC Characteristics, Beta Ratio Effects, Noise Margin.

(9)

UNIT II: MOS transistor theory

MOS Ideal I-V Characteristics, C-V Characteristics, MOS Small-signal Model, MOS Capacitance Models, MOS Gate Capacitance Model, MOSFET as a Switch, non-ideal I-V Effects: Velocity Saturation and Mobility Degradation, Channel Length Modulation, Body Effect, Sub-threshold Conduction, Junction Leakage, Tunneling.

(9)

UNIT III: CMOS technologies

CMOS Technologies: Background, Wafer Formation, Photolithography, Well and Channel Formation, Isolation, Gate Oxide, Gate and Source/Drain Formation, Contacts and Metallization, Passivation, Metrology. Scribe Line and Other Structures, MOSIS Scalable CMOS Design Rules, Micron Design Rules.

(9)

UNIT IV: Low power design

Delay Estimation using RC Delay Model and Linear Delay Model, Logical Effort, Parasitic Delay. Logical Effort and Transistor Sizing: Delay in a Logic Gate, Delay in Multistage Logic Networks, choosing the Best Number of Stages. Power Dissipation: Static Dissipation, Dynamic Dissipation, Low-Power Design. Interconnect: Resistance, Capacitance, Delay, and Crosstalk.

(**9**)

UNIT V: Circuit families

Circuit Families: Static CMOS, Ratioed Circuits, Cascade Voltage Switch Logic, Dynamic Circuits, Sense Amplifier Circuits, Bi-CMOS Circuits, Multiplexers, Sequential Static Circuits, Design of Latches and Flip-Flops.

(9)

Course Outcomes

Upon successful completion of the course, students will be able to

1. Explain the VLSI design methodologies and basic CMOS circuits used in modern Integrated circuits applications.
2. Discuss the fundamentals of MOS transistor theory.
3. Discuss about the CMOS processing technology.
4. Discuss about the integrated circuit characterization and performance estimation.
5. Describe the different types of circuit families.

Text Books

1. J. P. Uyemura: Introduction to VLSI Circuits and Systems, Wiley.
2. Neil H.E. Weste, David Harris, Ayan Banerjee: CMOS VLSI Design, Third Edition, Pearson Education.

Reference Books

1. Philip E. Allen and Douglas R Holberg: CMOS Analog Circuit Design, Oxford.
2. Carver Mead and Lynn Conway: Introduction to VLSI systems, BS Publication.
3. Plummer: Silicon VLSI Technology, Pearson Education.
4. J. P. Uyemura: Chip Design for Submicron VLSI, Cengage Learning.
5. Neil H.E. Weste, Kamran Eshraghian: Principle of CMOS VLSI Design, Pearson Education.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

OPEN ELECTIVE – IV

Open Elective - IV

18ENG301 CREATIVE WRITING

L	T	P	C
3	0	0	3

Course Description: The course functions as a broad-based introduction to various forms of creative writing, such as short fiction, poetry and drama. Short story writing is geared towards creative writing so that students learn about character, dialogue, voice, style and description in fiction. The course provides them with the opportunity to delve deeper into the analysis of selected short fiction and to work on stories of their own. Students explore the genre of poetry in-depth through their own writing and that of published poets. The study of playwriting involves many of the same focuses as short story writing, such as dialogue, character and plot. Students also experiment with writing these genres. The class is usually comprised of technique and style discussions, reading assignments and writing exercises.

Course Objectives:

This course enables the students to –

1. Familiarize with different forms of writing: poetry, scene writing, vignette and feature writing.
2. To encourage reading and acquainting, appreciating and responding to different genres of writing.

UNIT I: Introduction to creative writing and reading. Poetry, Short Story, Drama, Fiction, Non Fiction, Feature Writing, etc. **(9)**

UNIT II: Poetry, Scenario writing, feature and vignette writing. Haiku, Object Poem, List Poem, Visual Poem, Nature Poem. Scanning a poem and understanding its meaning. **(9)**

UNIT III: Writing a scene, finding sources from which to draw ideas to write scenes, creating an effective setting for a scene to take place; creating strong, believable characters in a scene **(9)**

UNIT IV: Learning how a scene can drive the plot of a story, how to effectively use point of view to enhance a scene, how to write interesting and useful dialogue, self-editing own writing. **(9)**

UNIT V: Writing a vignette, finding sources from which to draw ideas to write a vignette, organizing one's time and ideas to produce a longer piece of writing. **(9)**

Course Outcomes:

At the end of the course, students will be able to:

1. Develop skills in reading, writing, and editing various literary genres.
2. Obtain an awareness of the role of analysis to inform appreciation and understanding of poetry.
3. Demonstrate the ability to read and respond thoughtfully.
4. Develop plot of the story and sketch characters with relevant dialogues
5. Obtain effective writing skills such as good essays and projecting scholarly ideas.

Text Book:

1. Tondeur, Louise. 2017. How to Think Like a Writer: A Short Book for Creative Writing Students and Their Tutors. Louise Tondeur

Reference Books:

1. Middleton, Daniel. 2012. The 7 Points of Write: An Essential Guide to Mastering the Art of Storytelling, Developing Strong Characters, and Setting Memorable Scenes. 711 Press

2. Kumar, Amrita. 2017. Kissing the Demon: The Creative Writer's Handbook. Harper Collins
3. Mastering Creative Writing: A Writer's Guide by Dahveed Bar-Daniel (kindle book) published :12 April 2017

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations.

Dept. of Computer Science & Technology

Open Elective- IV

18HUM303 ENTREPRENEURSHIP DEVELOPMENT

L	T	P	C
3	0	0	3

Course Description: The objective of this course is to inculcate in students the skills necessary to craft strategies and initiatives which can enable growth and sustainability in an entrepreneurial venture, to include the effective management of inventory, receivables, production, human resources, financial resources, and risk. Students will develop higher-level critical thinking skills, evidenced by analysis, evaluation, and synthesis.

Course Objectives: The course is intended to:
1. Explain the basic concepts of entrepreneurship and its role in Indian Economy;
2. Describe the SWOT analysis, promotional and financial aspects of entrepreneurship
3. Explain project planning and feasibility studies;
4. Make the students acquire knowledge about women entrepreneurship; and
5. Explain the rural entrepreneurship and role of NGOs and EDPs in India.

UNIT I: INTRODUCTION
Entrepreneurial competencies, attitudes, qualities, functions - Forms of Entrepreneurship - Types of ownership - sole trading, partnership and corporation – Role of Government in Entrepreneurship Development. **(9)**

UNIT II: PROMOTIONAL & FINANCIAL ASPECTS OF ENTREPRENEURSHIP
Idea generation– opportunities - SWOT Analysis - patents and trademarks, Intellectual Property Rights. Financial Aspects of the Entrepreneurship: Source of Capital, Debt capital, seed capital, venture capital - Informal Agencies in financing entrepreneurs, Government Grants and Subsidies, Types of Investors and Private Offerings. **(9)**

UNIT III: PROJECT PLANNING AND FEASIBILITY STUDIES
Concept of Project, Project Life Cycle -Project Planning, Feasibility Report – Project proposal & report preparation. Technical Feasibility and Economic Viability – sources of New Ideas. **(9)**

UNIT IV: WOMEN ENTREPRENEURSHIP
Scope of entrepreneurship among women – Promotional effects – Institutional framework - Successful cases of women entrepreneurs. **(9)**

UNIT V: RURAL ENTREPRENEURSHIP AND EDPS
Role of NGO's– Organizing EDPs – Social Entrepreneurship – startups – Entrepreneurship development among target groups of society. **(9)**

Course Outcomes:
At the end of the course, students will be able to:
1. Understand the concepts of entrepreneurship and its role in Indian Economy;
2. Compare and apply sources of different promotional and financial aspects;
3. Understand and analyze the feasibility study in project planning;
4. Find the women entrepreneurship development in India; and
5. Assess the rural entrepreneurship and strengthen the role of NGOs and EDPs.

References:

1. Entrepreneurial Development, S. Chand and Company Limited, S.S. Khanka, New Delhi, 2009.
2. Fundamentals of Entrepreneurship, H. Nandan, PHI, First/e, New Delhi, 2009.
3. Entrepreneurship, 6/e, Robert D Hisrich, Michael P Peters, Dean A Shepherd, TMH,2009.
4. The Dynamics of Entrepreneurial Development and Management, Vasanth
5. Desai, Himalaya,2009
6. Entrepreneurship Management – text and cases, Bholanath Dutta, Excel Books, 2009
7. Entrepreneurship – New venture Creation, Holt, PHI, 2009

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations.

Dept. of Computer Science & Technology

Open Elective – IV

18MAT303 GRAPH THEORY

	L	T	P	C
Course Prerequisite: Modern Algebra, Linear algebra	**3**	**0**	**0**	**3**

Course Description:

Graph theory is the core content of Discrete Mathematics. This course introduces in an elementary way some basic knowledge and the primary methods in Graph Theory also it is important in regarding to find out the mathematical structures from graph theory in concrete examples.

Course Objectives

1. To understand the fundamental definitions and properties of graphs.
2. To know the concepts of trees and spanning trees.
3. To learn about the matching and factors, connectivity
4. To study the concepts of coloring of graphs, Planer graphs.
5. To introduce about the edges and cycles.

UNIT I: FUNDAMENTAL CONCEPTS

Graphs, path, cycles and trails, vertex degree and counting, directed graphs **(9)**

UNIT II: TREES AND DISTANCE

Basic properties, spanning trees, optimization and trees **(9)**

UNIT III: MATCHING AND CONNECTIVITY

Matching and covers, algorithm and applications, Cuts and Connectivity, k-connetced graphs. **(9)**

UNIT IV: COLOURING OF GRAPHS AND PLANER GRAPHS

Vertex coloring, structure of k-chromatic graphs, Euler's formula, characterization of planar graphs. **(9)**

UNIT V: EDGES AND CYCLES

Line graphs and edge coloring, Hamiltonian cycles, planarity, coloring and cycles. **(9)**

Text Book:

1. Douglas B. West, Introduction to Graph Theory, Prentice Hall of India 2014.

References

1. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science. Prentice-Hall.
2. Frank Harary, Graph Theory, Narosa.
3. R. Ahuja, T. Magnanti, and J. Orlin, Network Flows: Theory, Algorithms, and Applications, Prentice-Hall.

Course Outcomes:

At the completion of the course the students will be able to:

1. Understand the basic terminology of graphs.
2. Determine the number of trees and spanning trees in a graph.
3. Find the matching and connectivity in graphs.
4. Learn about the concepts of coloring of graphs and Planer graphs.
5. Determine the number of edges and cycles of a graph.

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations.

Dept. of Computer Science & Technology

Open Elective - IV

18MAT304 MATHEMATICAL MODELING AND NUMERICAL SIMULATION

L	T	P	C
3	0	0	3

Course Description:

This course introduces mathematical modelling and numerical simulation as tools for analyzing and solving real world problems. Here, data assimilation (DA) technique has been discussed to find the best estimate of the state by combining available information including model forecasts, observations and their respective errors. The accurate initial condition obtained by DA is used as input to numerical weather prediction (NWP) modules to improve the model forecast. Data visualization techniques allow engineering students to use their perception to better understanding of the implications of the data and their importance in many different fields.

Course Objectives:

1. To understand the overview of dynamic model system with dynamical and thermo-dynamical equations
2. To understand the basic concept and classification of partial differential equations and importance of initial and boundary value problem.
3. To introduce the development and use of modeling system in terms of scale and physical process.
4. To provide a conceptual and mathematical overview of the data assimilation.
5. To develop the skills for design and a comparative study between observed and modeled data.

UNIT I: BASIC CONSERVATION LAWS AND APPLICATIONS OF BASIC EQUATIONS

Total differentiation, Vectorial form of the momentum equation in rotating coordinates, Component equations in spherical coordinates, The continuity equation, The thermodynamic energy equation, Basic equations in isobaric coordinates, Balanced flow, Trajectories and streamlines, Thermal wind, Vertical motion **(9)**

UNIT II: NUMERICAL DISCRETIZATION OF EQUATIONS

Classification of partial differential equations (PDEs), Initial value problems, Finite difference method for space discretization, Boundary value problems: Heat, Wave and Laplace equations **(9)**

UNIT III: NUMERICAL MODELS AND PHYSICAL PROCESSES

Numerical models: Global, Regional, Mesoscale models, Parameterization of sub-grid scale physical processes: Planetary boundary layer, Moist microphysics physics, Cumulus convection, Radiation, Air-sea interaction processes, and Land-surface processes, Overview of interactions and parameterizations of these processes **(9)**

UNIT IV: DATA ASSIMILATION

Data assimilation: Empirical analysis schemes, Objective analysis schemes, Variational data assimilation techniques (unsteady three dimensional); Forecast error covariance; Dynamical and physical balance in the initial conditions; Quality control of observations; Atmospheric predictability; Concepts of chaotic systems and ensemble forecasting. **(9)**

UNIT V: DATA ANALYSIS AND VISUALIZATION

Introduction of WRF model and its Applications; Analysis of simulated and observed data sets through Grid Analysis and Display System (GrADS), MATLAB, and Excel software. **(9)**

Course outcomes

At the end of the course students are able to

1. Understand overview of dynamic model system and solve a set of dynamical and thermo-dynamical equations governing the state of the atmosphere.
2. Find accurate results through simulations by using proper and suitable representation of dynamical processes
3. Gain the knowledge of how and where to use the mathematical models in regional, mesoscale and global scales and develop an understanding of the physical processes
4. Compute the best estimate of the state by statistically combining model forecasts, observations, and their respective errors by using data assimilation technique.
5. Prepare the data for visualization and compare the results with observations.

Text books:

1. An Introduction to Dynamic Meteorology, Fourth Edition, by James R. Holtan, Elsevier Academic Press
2. Atmospheric Modeling, Data Assimilation, and Predictability, by Eugenia Kalnay (Cambridge University Press, 2003)
3. A description of the advanced research WRF version 3. Tech. Note, by Skamarock, W.C (2008).

References:

1. Dynamics, Volume 101, Second Edition: Physical and Numerical Aspects. Academic Press
2. Mark Z Jacobson. Fundamentals of Atmospheric Modeling, Cambridge University Press
3. James C. McWilliams. Fundamentals of Geophysical Fluid Dynamics, Cambridge University Press
4. Introduction to Grid Analysis and Display System (GrADS), by Guilherme Martins (2014), DOI:10.13140/RG.2.1.2594.2249.

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations.

Open Elective - IV

18PHY303 THIN FILM TECHNOLOGY AND ITS APPLICATIONS

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description:
Nucleation, crystallization, surface energy, various thin film coating processes including both physical vapour deposition such as evaporation, sputtering, pulsed laser deposition and chemical vapour deposition, spray coating, and other methods such as spin-coating, plasma polymerization, Langmuir Blodgett, transport phenomena in thin films, various properties of thin films, techniques and method to characterize thin films, current application of thin film, introduction to fabrication of thin film devices

Course Objectives:
1. To provide students with a comprehensive overview on the fundamentals of thin film preparation and characterization.
2. To enable the students to develop a thorough understanding of how core physics can be used to understand thin film deposition processes.
3. To establish the correlation between processing variables and materials characteristics and performance within the framework of key modern technologies.
4. To realize thin film applications to science and technology

UNIT I: PHYSICS OF THIN FILMS
Introduction - Role of thin films in devices - Thin film definition - Crystalline and amorphous films - Crystal defects - Nucleation and growth - film formation. **(9)**

UNIT II: THIN FILM DEPOSITION TECHNIQUES
Physical methods of films deposition-evaporation, e-beam, sputter deposition, pulsed laser, molecular beam epitaxy. Chemical methods of film deposition -Deposition of Inorganic films from Solutions-Chemical vapour deposition - Electrolysis, Anodization, Spray pyrolysis, Other techniques: Langmuir Blodgett and Spin Coating. **(9)**

UNIT III: PROPERTIES OF THIN FILMS
Structural-Optical-Electrical-Magnetic-Mechanical and Thermal properties of thin films. **(9)**

UNIT IV: CHARACTERIZATION OF THIN FILMS
Imaging Techniques (SEM, AFM, TEM) - Structural Techniques (XRD, Raman)-Optical Techniques (UV-Vis-NIR, PL)-Electrical Techniques (Hall Effect, IV, CV)-Magnetic Techniques (EPR, H-V curve)-Mechanical Techniques (Hardness testing)-Thickness measurement (profilometer, ellipsometry). **(9)**

UNIT V: APPLICATIONS OF THIN FILMS
Transparent conducting coating - Optical coating – Solar cells – Photocatalytic – Sensors - Superconductivity- Superhard coatings – Thin film transistors. **(9)**

Course Outcomes:

After a successfully completed course the students will be able to:

1. Discuss the differences and similarities between different vacuum based deposition techniques, evaluate and use models for nucleating and growth of thin films.
2. Asses the relation between deposition technique, film structure, and film properties.
3. Know the typical thin film applications.
4. Motivate selection of deposition techniques for various applications.

Text books:

1. Thin Film Deposition: Principles and Practice, *Donald L. Smith*, McGraw Hill, Singapore, 2001.
2. Maissel, L.I and Glang. R, "Handbook of thin film technology", McGraw Hill, 1970.

References:

1. Thin film phenomena / *Kasturi L. Chopra*, New York: McGraw-Hill, c1969.
2. G. Cao, "Nanostructures & Nanomaterials: Synthesis, Properties & Applications" Imperial College Press, 2004.
3. An introduction to physics and technology of thin films / *Alfred Wagendristel, Yuming Wang*, Singapore: World Scientific, c1994.
4. Thin film processes, *John L Vossen, Werner Kehn* editors, Academic Press, New York, 1978.
5. Thin film physics / *O.S. Heavens*, London: Methuen, c1970.

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Dept. of Computer Science & Technology

Open Elective – IV

18CHE303 INTRODUCTION TO NANO SCIENCE AND TECHNOLOGY

L	T	P	C
3	0	0	3

Course Description

This is primarily a lecture course which brings together relevant knowledge from the disciplines of physics and chemistry to give students a fundamental understanding of the integrated multidisciplinary nature of Nanotechnology.

Objectives

1. To understand the emergence of nanoscience and technology through history.
2. The various process techniques available for nanostructured materials.
3. The role of nanotechnology in electronics how basic nano-systems work
4. To use physical reasoning to develop simple nanoscale models to interpret the behaviour of such physical systems

UNIT I: MOLECULE TO MATERIALS: BASICS OF NANOTECHNOLOGY

History & emergence (Feynman to present) of Nanoscience and Nanotechnology, Challenges in Nanotechnology. Atomic Structures: Rutherford and Bohr's model of atom. Bohr's model to Quantum: Wave function, Uncertainty principle, Orbital quantum numbers, Shape of the orbitals. Types of simple crystal structures, defects in crystals. **(9)**

UNIT II: TYPES AND SYNTHESIS OF NANOSTRUCTURES

Definition of a Nano system - Zero Dimensional (OD), One Dimensional (1D) - Two Dimensional (2D) - Three Dimensional (3D) nanostructured materials. Nanoscale building blocks, Top-down and Bottom-up approaches. Synthesis of Nanomaterials – Physical & Chemical methods: Chemical Vapour Deposition (CVD), Atomic Layer Deposition (ALD), Chemical Reduction, Co-precipitation, Emulsion Polymerization (Polymer and Organic NPs), Sol-Gel, Green synthesis of Nanoparticle (NP). **(9)**

UNIT III: PROPERTIES OF NANOMATERIAL

Thermal, Mechanical, Optical, Electrical and Magnetic properties of nanomaterials (Metal oxides, Ceramics, Nanocomposites, Semiconductors). Carbon age materials: CNTs, and other Carbon-based materials). Effect of size and shape on the properties of nanomaterials. **(9)**

UNIT IV: CHARACTERIZATION OF NANOMATERIALS

Structure: Powder XRD (SAXS); Composition: XPS; Thermal: TG-DTA; Optical & Electron microscopes: Atomic force microscopes (AFM), Scanning electron microscope (SEM), Transmission electron microscope (TEM); Magnetic characterization (SQUID). **(9)**

UNIT V: APPLICATIONS OF NANOMATERIALS

Molecular electronics and nano-electronics – LED applications, Quantum electronic devices - CNT based transistor and Field Emission Display – Biological (anti-bacterial, anti-fungal, anti-microbial) applications - Biochemical sensor - Membrane based water purification, Target based drug delivery system. **(9)**

Course Outcomes:

Upon completion of this course the students will be able to:

1. Understand the correlation between atomic, molecular structures and nanomaterials
2. Classify the types and synthesis the nanomaterials based on the needs of the society and environment.
3. Infer and interpret the properties of nanomaterials
4. Apply the knowledge of characterization tools towards making the sustainable engineering products.
5. Illustrate the application of various nanomaterials in daily life, industry towards the sustainable development.

Text Books:

1. M. Wilson, K. Kannangara, G. Smith, M. Simmons, and B. Raguse, Nanotechnology: Basic science and Emerging technologies, Overseas Press India Pvt Ltd, New Delhi, First Edition, 2005.
2. C. N. R. Rao, A. Muller, and A. K. Cheetham (Eds), The chemistry of nanomaterials: Synthesis, properties and applications, Wiley VCH Verlag Gmbh & Co, Weinheim, 2004.
3. Kenneth J. Klabunde (Eds), Nanoscale Materials Science, John Wiley & Sons, InC, 2001.
4. C. S. S. R. Kumar, J. Hormes, and C. Leuschner, Nanofabrication towards biomedical applications, Wiley - VCH Verlag GmbH & Co, Weinheim, 2004.
5. T. Pradeep, Nano: The Essentials, Understanding Nanoscience and Nanotechnology, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.

References:

1. W. Rainer, *Nano Electronics and information Technology*, Wiley, 2003.
2. K. E. Drexler, *Nano systems*, Wiley, 1992.
3. G. Cao, *Nanostructures and Nanomaterials: Synthesis, properties and applications*, Imperical College Press, 2004.
4. P. Yang, Chemistry of Nanostructured Materials, World Scientific Publishers, 2005.

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Open Elective - IV

18CHE304 COMPUTATIONAL METHODS IN MATERIALS SCIENCE AND ENGINEERING

L	T	P	C
3	0	0	3

Course Prerequisite:

Exposure to Introductory engineering mathematics, introductory materials science and introductory programming courses is preferred.

Course Description:

This course deals with various computational approach and mathematical methods to understanding and apply different concepts in materials science and engineering.

Course Objectives:

1. To get exposed to the basic concepts in Materials Science and Engineering.
2. To understand the basic concepts of Programming and Graphical plotting.
3. To introduce the basic concepts of Data types and handling of various data.
4. To familiarize the basic concepts of modelling and simulation.
5. To acquire and apply the current knowledge and trends in the field of Computational Materials Science.

UNIT I: INTRODUCTION TO COMPUTATIONAL MATERIALS SCIENCE AND ENGINEERING

Concepts in materials science and engineering; use of computers and freely available open source software to: data handling; understand concepts and solve problems of engineering interest.

(9)

UNIT II: PROGRAMMING AND PLOTTING

Introductions to the advanced concept C programming language; open source software for numerical computations and visualization (gnuplot, GNU Octave, Scilab); introduction to the LaTeX software for report preparation along with other miscellaneous software and programs.

(9)

UNIT III: DATA TYPES AND HANDLING TECHNIQUES

Classification, and understanding of data properties, data handling - plotting, fitting, functional forms, interpolation, and integration. **(9)**

UNIT IV: COMPUTATIONAL MODELING AND SIMULATIONS

Understanding the materials properties; atomistic and electronic modelling of materials; concepts in molecular dynamics and its application using Quantum ESPRESSO. **(9)**

UNIT V: CURRENT TRENDS IN COMPUTATIONAL MATERIALS SCIENCE

Applied materials for various engineering field; research literature exploration; real-time application of computational methods in materials science and engineering, mini-project. **(9)**

Course Outcomes:

At the end of the course, the students will be able to

1. Understand the importance and applications of computational methods in Materials Science and Engineering.
2. Be familiarized with the tools of the trade, namely programming and graphical plotting.
3. Be able to understand and access the various types of data sets and appropriately handle it to productively work with it.
4. Get the knowledge about handling various open source computational tools and their effective usage to do computational modeling and simulations.
5. Be familiarized with up to date trends in computational materials science by taking up real time research problems and provide solutions.

Text Books:

1. Computational Materials Science: An Introduction, Second Edition 2nd Edition, by June Gunn Lee, 2014
2. Materials science and engineering: an introduction, William D Callister, Sixth edition, John Wiley & Sons, 2013.
3. The C programming language, Brian W Kernighan and Dennis M Ritchie, Second edition, PHI Learning Private Limited, 2010.
4. Materials science and engineering: a first course, V Raghavan, Fifth edition, PHI Private Limited, 2008.
5. Physical metallurgy principles, Robert E. Reed-Hill, Second edition, Affiliated East-West Press Pvt. Limited, 2008.
6. An introduction to materials science and engineering, Kenneth M Ralls, Thomas H Courtney, and John Wulff, Wiley India Pvt. Ltd., 2011.

References:

1. Materials Science and Engineering,V Raghavan,Prentice-Hall India, 2004
2. Advanced Engineering Mathematics, E Kreyzig, Wiley-India,1999.
3. A Review of Computational Methods in Materials Science, International Journal of Molecular Sciences 10(12):5135-216

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Open Elective- IV

18CE304 GREEN BUILDING AND ENERGY CONSERVATION

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description: The course covers various aspects of bioclimatic architecture like climate sensitive design, passive solar architecture, Water management, green building materials and construction techniques.

Course Objectives:

1. The course introduces concepts of sustainability and bioclimatic design in planning, construction and life of buildings.
2. This course intends to equip students with technical knowledge of energy-efficient green buildings
3. This course guide students, through projects, to apply concepts and ideas for the design of a green building by introducing them to green initiatives and ratings.
4. This course also initiates students in basics of functional design and drawing of the various buildings using the above concepts.

UNIT -I: GREEN BUILDING CONCEPTS

Introduction to bioclimatic architecture - Sustainability in building science and Functional planning - Orientation - Elements of building design and drawing – Building regulations and bylaws - Traditional and Vernacular Architecture - Climate zones - Design Charts - sun path diagram - Solar angles - Indices of thermal comfort - Vernacular buildings in different climate zones. **(9)**

UNIT-II: CLIMATE RESPONSIVE SCIENTIFIC PROCESS OF DESIGN

Introduction - various steps in Site planning - Plan form Building envelope Landform -Topography – vegetation - water bodies; Orientation - S/V ratio - P/A ratio - Walls, Fenestration - Roof and floors - Active and passive solar strategies - Passive solar architecture. **(9)**

UNIT-III: THERMAL FLOW IN BUILDINGS

Calculation of thermal conductance - Heat flow through different building elements - Ventilation and day lighting - Design and placement of openings - Water management in buildings - Techniques to recycle, reuse and harvest water. **(9)**

UNIT IV: GREEN BUILDING MATERIALS AND CONSTRUCTION

Material properties - Energy efficiency using various materials - emerging new materials Construction techniques - Techniques for roof, wall and foundations. **(9)**

UNIT V: ECONOMY OF GREEN BUILDING

Cost of building - operation and maintenance - Green building rating system - Evaluation criteria of LEED - TERI GRIHA case studies - Case studies in different climate zones. **(9)**

Course Outcomes:

1. An understanding on green building materials and construction techniques.
2. Knowledge on renewable energy and energy conservation through material usage.
3. A thorough understanding on designing green buildings

Text books:

1. Krishnan, A., Baker, N., Yannas, S., &Szokolay, S. (Eds.). (2001). Climate responsive architecture, a design handbook for energy efficient buildings. New Delhi: Tata McGraw–Hill Publishing Company.
2. TERI & ICAEN (InstitutCatalad'Energia). (2004). Sustainable building design manual (Vol. II). New Delhi: The Energy and Resources Institute (TERI) Press.

References:

1. Bureau of Indian Standards. (1995). SP:41, Handbook on functional requirements of buildings (other than industrial buildings) (First reprint ed.). New Delhi: Bureau of Indian Standards.
2. Indian Green Building Council, LEED-India. (2011). LEED 2011 for India- Green building rating system, abridged reference guide for new construction and major renovations (LEED India NC). Hyderabad: Indian Green Building Council.
3. Koenigsberger, O., ingersoll, T. G., Mayhew, A., &Skozolay, S. V. (2011). Manual of Tropical Housing and Building. Hyderabad: Universities Press.
4. Prabhu, Balagopal T S, K Vincent Paul, and C Vijayan. Building Design and Drawing. Calicut: Spades Publishers, 2008.
5. Szokolay, S. V. (2008). Introduction to Architectural Science – The Basis of sustainable Design (Second ed.). Architectural Press/Elsevier.
6. The Energy and Resources Institute (TERI). (2011). Green Rating for Integrated Habitat Assessment (GRIHA) manual. New Delhi: TERI press.
7. Journals: Energy and Buildings, Building and Environment, Other relevant publications.
8. National Building Code, Bureau of Indian Standards: New Delhi. 2005; Building Bye laws and building rules of selected Indian urban and rural areas
9. Swamy, N. K., & Rao, A. K. (2013). Building planning and Drawing, New Delhi, Charothar Publishing House

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Dept. of Computer Science & Technology

Open Elective- IV

18CE305 ENVIRONMENTAL ENGINEERING

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

The course covers demand, quality, treatment and distribution of water along with characterization, collection, low cost treatment of waste water and household drainage. Similarly, air pollution, noise pollution and solid waste management are also included.

Course Objectives

1. To explain water quality standards, treatment, distribution of drinking water
2. To analyze the characteristics of wastewater and discuss about various units of sewage treatment system.
3. To explain various impacts of air and various methods to control air pollution
4. To describe about solid waste generation, characterization, impacts and various management techniques
5. To discuss about generation and management of electronic waste.

UNIT I: WATER TREATMENT

Water- Sources of Water, quality issues, health impacts of contaminated drinking water, water quality requirement for different beneficial uses, water quality standards, water quality indices, water safety plans, Layout of water Supply systems, components of water supply system; Distribution system, working principle of various units of surface water treatment plant layout **(9)**

UNIT II: SEWAGE TREATMENT

Quantity of Sewage, Sewage flow variations. Sewage pumping; Sewerage, Sewer appurtenances, Storm Water; sewage disposal standards, pollution due to improper disposal of sewage, wastewater treatment, aerobic and anaerobic treatment systems, suspended and attached growth systems, recycling of sewage, zero liquid discharge **(9)**

UNIT III: URBAN AIR POLLUTION AND CONTROL TECHNIQUES

Air - Composition and properties of air, source and impacts of air pollution-on human, vegetation and strucutres, types of air pollutants various air pollution control laws, National Ambient Air Quality Standards, Air Quality Index, Air pollution meteorology and dispersion, Principles and working of various air pollution control equipment- gravity settling chamber, cyclone separators, fabric filters and electrostatic precipitators. **(9)**

UNIT IV: MUNICIPAL SOLID WASTE MANAGEMENT

Municipal Solid Waste-Characteristics and Quantities, MSW Rules, Municipal Solid Waste Collection, Transportation, Segregation and Processing, compositing, recycling, disposal- landfilling and incineration. **(9)**

UNIT V: ELECTRONIC WASTE MANAGEMENT

E-Waste Generation, E-Waste Rules, Techniques for Recycling and Recovery – glass, plastics, ferrous and non-ferrious materials **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Explain about impacts of drinking water contamination and various units of surface water treatment plant
2. Discuss about sewage generation and various methods of sewage treatment
3. Describe the impacts of air pollution and review various air control methods
4. Discuss about the impacts of solid waste and various solid waste management techniques
5. Explain the impacts and beneficial reuse of electronic waste

Text Books:

1. Birdie, G.S, Birdie, J.S., Water supply and sanitary Engineering, Including Environmental Engineering, Water and Air Pollution Laws and Ecology, Dhanpat Rai Publications, 1996.
2. Garg, S.K., Sewage Disposal and Air Pollution Engineering, Khanna Publishers, 2008.
3. Rao M and Rao H.V.N. Air Pollution, McGraw Hill Education, 2017.
4. Jagbir Singh and Ramanathan A. L., Solid Waste Management: Present and Future Challenges, I K International Publishing House Pvt. Ltd., 2009

Reference Books:

1. Punmia, B.C, Ashok K Jain, Arun K Jain., Waste Water Engineering, Laxmi Publications, 1998.
2. Peavy, H., Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw - Hill International Editions, New York 1985
3. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication
4. Metcalf & Eddy, Wastewater Engineering Treatment and Dispose, McGraw Hill Publication

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Open Elective- IV

18ME304 INTERNET OF MANUFACTURING THINGS

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description:
The manufacturing industries are the significant sustainable sources for the modern society. Traditional manufacturing systems and relative management approaches need constant review and upgrade to meet the demands of modern complex products. Internet of Things (IoT), has potential to collect, process, analyze and communicate real time data, while enhancing overall productivity within given time frame with higher flexibility and transparency. This course tries to provide the essential knowledge to bridge the IoT and Manufacturing systems.

Course Objectives:

1. To provide the basic knowledge and importance of IoT and its logic and applications in Manufacturing Industry.
2. To provide the basic knowledge of real time information sensing and cloud computing in manufacturing system.
3. To understand the concepts of IoT enabled smart trolleys and assembly systems.
4. To provide basic understanding of real-time production performance analysis methods. and scheduling system.
5. To provide basic understanding of real-time, information driven production scheduling system.

UNIT I:
Introduction- Concept of IoT, Existing manufacturing paradigms and their limitations, Applications of IoT in Manufacturing System (MS), The Concept of IoT-MS and its limitations.Overview of IoT-Enabled Manufacturing System- Overall architecture of IoT-MS, Integration framework of real-time manufacturing information, The work logic of IoT-MS, Core technologies in IoT-MS. **(9)**

UNIT II:
Real-Time(RT) Multisource Manufacturing Information Sensing System - Introduction, Overall Architecture of RT and multisource RMMISS, Deployment of multi-sensors, Multiple sensors manager, Multiple source manufacturing Information Capturing and Sharing, Case studies.Cloud Computing-Based Manufacturing – Introduction, Overall architecture, Cloud Machine Model, MS-UDDI, Task driven manufacturing service method. **(9)**

UNIT III:
IoT-Enabled Smart Assembly Station- Introduction, RFID based applications and assistant services in assembly line, Overall architecture, Real-time: Status Monitoring, Production Guiding, Data Sharing, Production Requeuing. IoT Enabled Smart Trolley– Material handling and real time strategy, RT-data capturing in manufacturing field, overall architecture, Real-time: Information capturing, Encapsulation, Exchange, Workflow based guidance. Two stage combination optimization method. **(9)**

UNIT IV:
Real-Time (RT) Production Performances Analysis Method- Real-time: Production monitoring technique, KPI analysis, Anomaly analysis. Overall architecture, Even hierarchy of critical event, HTCPN analysis. Real time production anomaly diagnosis. **(9)**

UNIT V:
Real-Time Information Driven Production Scheduling System – Introduction, RT production scheduling, Agent technology, Manufacturing information monitor technology, Overall architecture, Equipment agent, Capability evaluation agent model, RT- scheduling agent model, Production execution monitor agent model. **(9)**

Course Outcomes:
The focus of this course is to study the inculcation of IoT in manufacturing systems and how the system turns smart. By the end of the course student should:

1. Be able to understand the fundamentals of IoT and its application in manufacturing systems.
2. Have a clear overall picture of multisource manufacturing information sensing system and cloud manufacturing.
3. Outline various methods of IoT enabled smart assembly systems and summarize the usage of smart trolleys
4. Make use of various RT- production performance analysis methods for test its applicability to real life problems.
5. Make use of various RT- information driven production scheduling system for test its applicability to real life problems.

Text Book:

1. Fei Tao, Y. Zhang, “Optimization of Manufacturing Systems Using the Internet of Things”, 1st Edition, 2017, Academic Press, Elsevier.

Reference Book:

1. A. Gilchrist, “Industry 4.0: The Industry Internet of Things”, 1st Edition, 2016, Apress.
2. M. Dastbaz, P. Cochrane, “Industry 4.0 and Engineering for a Sustainable Future”, 1st Edition, 2019, Springer.

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Open Elective- IV

18ME305 ENTREPRENEURSHIP

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description:
This course is designed to ignite the entrepreneurship idea into the young minds of engineers. Gives the complete details to setup an enterprise which includes the generating the business ideas, writing a business plan executing the plan successfully.

Course Objectives:
1. Understand the requirements of entrepreneurship as a profession.
2. Understand and develop the business plan.
3. Identify the various financial terms and conditions of new business venture.
4. Selection of plant location and choosing layout.
5. Analyse the market research for new ventures and small businesses.

UNIT I: INTRODUCTION
Introduction to Entrepreneurship Definition of Entrepreneur, Entrepreneurial Traits, Entrepreneur vs. Manager, Entrepreneur vs Intrapreneur. The Entrepreneurial decision processes. Role of Entrepreneurship in Economic Development, Ethics and Social responsibility of Entrepreneurs. Opportunities for Entrepreneurs in India and abroad. Woman as Entrepreneur. Case studies about successful Entrepreneur. **(9)**

UNIT II : CREATING AND STARTING THE VENTURE
Sources of new Ideas, Methods of generating ideas. The Business Plan Nature and scope of Business plan, Writing Business Plan, Evaluating Business plans, Using and implementing business plans. Marketing plan, financial plan and the organizational plan, Launching formalities. Develop the business plan and evaluate with team. **(9)**

UNIT III: FINANCING AND MANAGING THE NEW VENTURE
Sources of capital, venture capital, angel investment, Record keeping, recruitment, motivating and leading teams, financial controls. Marketing and sales controls. E-commerce and Entrepreneurship, Internet advertising. New venture Expansion Strategies and Issues, Features and evaluation of joint ventures, acquisitions, merges, franchising. Case studies about entrepreneur who success or failure in their business based on the financial control. **(9)**

UNIT IV: PLANT LAYOUT
Choosing location and layout, Issues related to Selection of layout. Production and Marketing Management, Selection of production Techniques, plant utilization and maintenance. Case study about selection of site and plant layout for new business venture. **(9)**

UNIT V: MARKET ANALYSIS
Designing the workplace, Inventory control, material handling and quality control. Marketing functions, market segmentation, market research and channels of distribution, Sales promotion and product pricing. Case studies on market analysis on entrepreneur perspective.

(9)

Course Outcomes:

At the end of the course, students should be able to

1. Describes the sources of new business ideas, methods to develop new ideas and use the problem solving techniques
2. Able to Write a business plan which includes Financial plan, Organizational Plan and Marketing Plan
3. Able to identify the financial sources for new business ventures
4. Able to select a plant layout and draw a plant layout
5. Design a work place and Analyze the market research for new business.

Text Books:

1. Entrepreneurship, Robert Hisrich, & Michael Peters, 5/e TMH.
2. Entrepreneurship, Dollinger, Pearson, 4/e, 2004.

References:

1. Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya Publ. House, 2004.
2. Harvard Business Review on Entrepreneurship. HBR Paper Back, 1999.
3. Entrepreneurial Management, Robert J.Calvin, TMH, 2004.

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Open Elective- IV

18ME306 TOTAL QUALITY MANAGEMENT

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description

Total quality management (TQM) is a philosophy, methodology and system of tools aimed to create and maintain mechanism of organization's continuous improvement. It involves all departments and employees for the improvement of processes and products. It helps to reduce costs, exceed needs and expectations of customers and other stakeholders of an organization. TQM encompasses the concepts of business and social excellence that is sustainable approach to organization's competition, efficiency improvement, leadership and partnership.

Course Objectives:

The students will be able to:

1. Study comprehensive knowledge about the principles, practices, tools and techniques of total quality management.
2. Gain knowledge on leadership, customer satisfaction, addressing customer complaints, team work, employee involvement, related to customer and supplier partnership.
3. Gather information on various tools and techniques, concept on Six Sigma, bench marking and Failure Mode Effective Analysis (FMEA).
4. Know the importance of Quality circle, Quality Function Deployment, Taguchi design and case studies related to TQM.
5. To be aware of international/national Quality awards.

UNIT I: INTRODUCTION

Introduction - Need for quality - Evolution of quality - Definition of quality – Quality control, Quality management and Quality Assurance - Definition of TQM – Basic concepts of TQM - TQM Framework - Contributions by Deming, Juran and Crosby – Dimensions of quality – Benefits of quality and Barriers. **(9)**

UNIT II: TQM PRINCIPLES

TQM principles - Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – Supplier partnership – Partnering, Supplier selection, Supplier Rating. **(9)**

UNIT III: TOOLS AND TECHNQUES I

The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA. **(9)**

UNIT IV: TQM TECHNIQUES

Quality circles – Quality Function Deployment (QFD) – Design of Experiments-Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures. **(9)**

UNIT V: IMPELMENTATION OF TQM

Steps for Implementation of TQM, KAIZEN, 5S, JIT, POKAYOKE, I - Introduction to Robust Design, ISO Standards, Need for ISO 9000 and 14000 series, Quality Systems and Case studies. **(9)**

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. Understand the various principles and practices of TQM to achieve quality.
2. Identify the various statistical approaches for Total Quality Control.
3. Demonstrate the TQM tools for continuous process improvement.
4. Adopt the importance of ISO and Quality systems.
5. Make use of the concepts of TQM to solve case studies

Text Book:

1. Dale H. BesterField, et al., Total Quality Management, Pearson Education Asia, Third Edition, Indian Reprint (2003).

References:

1. James R. Evans and William M. Lindsay, The Management and Control of Quality, (6th Edition), South-Western (Thomson Learning), 2005.
2. Oakland, J.S. TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, Third Edition (2003).
3. Suganthi,L and Anand Samuel, Total Quality Management, Prentice Hall (India) Pvt. Ltd. (2006) Model.

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Open Elective- IV

18EEE303 ROBOTICS

L	T	P	C
3	0	0	3

Course Prerequisite: Control Systems

Course Description:
Robotics is an interdisciplinary area ranging from mechanical & electrical component design to advanced sensor technology, incorporating computer systems and Artificial Intelligence (AI). With advances in AI-techniques & computational power in recent years, it has become one of the most interesting area for multidisciplinary research, with lots of commercial applications already in market.

Course Objectives:
1. To know the fundamentals of Robotics & its Applications.
2. To make students capable of handling robot manipulator tasks in real, as well as in simulation environment.
3. To know about kinetic and Jacobian modeling
4. To know about sensors and actuators.

UNIT I: INTRODUCTION & TRANSFORMATION AND MAPPING
Evolution of Robots and Robotics, Laws of Robotics, Advancement in Robots, Robot Anatomy, Human Arm Characteristics, Design and Control Issues, Manipulation and Control, Sensors and Vision, Robotic Programming and Future Prospects. Coordinate Frames, Object Description in Space, Transformation of Vectors, Inverting a homogenous transform, Fundamental Rotation Matrices. **(9)**

UNIT II: KINEMATIC MODELS
Direct Kinematic Model- Mechanical Structure and Notations, Description of links and joints, Kinematic modelling of the Manipulator, Denavit - Hartenberg notation, Kinematic relationship between Adjacent Links, Manipulator Transformation Matrix. Inverse Kinematic Model- Manipulator workspace, Solvability of Inverse Kinematic model, Solution Techniques, Closed form solution. **(9)**

UNIT III: JACOBIAN AND DYNAMIC MODELLING
Differential motion and statics- Linear and Angular Velocity of a Rigid Body, Relationship between Transformation, Mapping Velocity Vector, Velocity propogation along links, Manipulator Jacobian, Jacobian Inverse, Jacobian Singularities, Static Analysis. Dynamic modelling- Lagrangian mechanics, Lagrange-Euler formulation, Newton-Euler formulation, Comparison of Langrange-Euler and Newton-Euler formulation, Inverse Dynamics**.** **(9)**

UNIT IV: ROBOT MANIPULATOR CONTROL AND PATH PLANNING (9)
Robot manipulator control- Introduction, Control of Puma Robot Arm, Computed Torque Technique, near minimum time control, Variable structure control, Non linear decoupled feedback control, Resolved motion control, Adaptive ControlPath/Trajectory Planning- Introduction, Joint space techniques, Cartesian space techniques, State space search, Problem reduction and use of predicate logic, Means-Ends analysis, Problem solving and robot learning, Robot Task Planning and Basic problems. **(9)**

UNIT V: SENSORS AND ACTUATORS
Range sensing, Proximity sensing, Touch sensors, Force and Torque sensing, Artificial Intelligence techniques using Neural Networks and Fuzzy control. **(9)**

Course Outcomes:
At the end of the course, students will able to
1. Understand the fundamentals of Robotics.
2. Analyze the mechanical structure and notations kinematic model.
3. Analyze the jacobian and dynamic modeling.
4. Explain the robot manipulator control and path planning.
5. Describe the various sensors and actuators.

Text Book:

1. Mittal, R.K. and Nagrath, I.J., Robotic and Control, Tata McGraw Hill, New Delhi, 2003.

References:

1. Fu, K.S., Gonzalez, R.C., and Lee, C.S.G., Robotics Control, Sensing, Vision and Intelligence, McGraw Hill, 1988.
2. Craig, J.J., Introduction to Robotics: Mechanism & Control. Addison Wesley, 1986.
3. Paul, R.P., Robot Manipulator: Mathematics Programming & Control. MIT Press, 1981.
4. Pugh,A., RobotSensors, Vision Vol.-I.Springer Verlag, 1986.
5. Groover, M.P., Industrial Robotics Technology, programming & Application, McGraw Hill, 1986.

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Open Elective – IV

18EEE304 ELECTRICAL SAFETY

L	T	P	C
3	0	0	3

Course Prerequisite: BEE

Course Description:
To provide a comprehensive exposure to electrical hazards, various grounding techniques, safety procedures and various electrical maintenance techniques.

Course Objectives:
1. To impart knowledge on electrical hazards and safety equipment.
2. To analyze and apply various grounding and bonding techniques.
3. To select appropriate safety method for low, medium and high voltage equipment.
4. To understand how to participate in a safety team.
5. To carry out proper maintenance of electrical equipment by understanding various standards.

UNIT I: ELECTRICAL HAZARDS
Primary and secondary hazards- arc, blast, shocks-causes and effects-safety equipment- flash and thermal protection, head and eye protection-rubber insulating equipment, hot sticks, insulated tools, barriers and signs, safety tags, locking devices- voltage measuring instruments- proximity and contact testers-safety electrical one line diagram- electrician's safety kit. **(9)**

UNIT II: GROUNDING AND BONDING
General requirements for grounding and bonding- definitions- grounding of electrical equipment- bonding of electrically conducting materials and other equipment- connection of grounding and bonding equipment- system grounding- purpose of system grounding- grounding electrode system- grounding conductor connection to electrodes-use of grounded circuit conductor for grounding equipment- grounding of low voltage and high voltage systems. **(9)**

UNIT III: SAFETY METHODS
The six step safety methods- pre job briefings- hot -work decision tree-safe switching of power system- lockout-tag out- flash hazard calculation and approach distances- calculating the required level of arc protection-safety equipment , procedure for low, medium and high voltage systems- the one minute safety audit. **(9)**

UNIT IV: SAFETY TEAM
Electrical safety programme structure, development- company safety team- safety policy- programme implementation- employee electrical safety teams- safety meetings- safety audit- accident prevention- first aid- rescue techniques-accident investigation. **(9)**

UNIT V: MAINTENANCE OF ELECTRICAL EQUIPMENT
Safety related case for electrical maintenance- reliability centered maintenance (RCM) - eight step maintenance programme- frequency of maintenance- maintenance requirement for specific equipment and location- regulatory bodies- national electrical safety code- standard for electrical safety in work place- occupational safety and health administration standards. **(9)**

Course Outcomes:

At the end of the course, students will able to

1. Describe electrical hazards and safety equipment.
2. Analyze and apply various grounding and bonding techniques.
3. Select appropriate safety method for low, medium and high voltage equipment.
4. Participate in a safety team.
5. Carry out proper maintenance of electrical equipment by understanding various standards**.**

Text Book:

1. Dennis Neitzel, Al Winfield,'Electrical Safety Handbook', McGraw-Hill Education , 4th Edition,2012.

References:

1. John Cadick, 'Electrical Safety Handbook', McGraw-Hill School Education Group, 1994.
2. Maxwell Adams.J, "Electrical safety- a guide to the causes and prevention of electric hazards",The Institution of Electric Engineers, 1994.
3. Ray A. Jones, Jane G. Jones, 'Electrical safety in the workplace', Jones & Bartlett Learning, 2000.

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Open Elective – IV

18ECE303 NANO ELECTRONICS

L	T	P	C
3	0	0	3

Course Prerequisite: CMOS VLSI Design, Electronic Devices

Course Description:
This course provides an overview of Semiconductor Physics and carrier transport phenomenon. It illustrates Quantum Mechanics, & Nano-materials, Nanoscale MOSFET Transistors and their characteristics.

Course Objectives:
1. Apply the knowledge of Quantum physics to illustrate energy band structure.
2. Understand the basic physics of Kronig Penny Model.
3. Understand the fundamentals of operation of the main semiconductor electronic devices.
4. Understand and utilize the mathematical models and characteristics of MOS transistors for circuits and systems.
5. Understand and appreciate the nano-materials process.

UNIT I: INTRODUCTION TO NANOTECHNOLOGY
Introduction to nanotechnology, meso-structures, Basics of Quantum Mechanics: Schrodinger equation, Density of States. **(9)**

UNIT II:
Particle in a box Concepts, Degeneracy. Band Theory of Solids. Kronig-Penny Model. Brillouin Zones. **(9)**

UNIT III:
Shrink-down approaches: Introduction, CMOS Scaling, The nanoscale MOSFET, Finfets, Vertical MOSFETs, limits to scaling, system integration limits (interconnect issues etc.). **(9)**

UNIT IV:
Resonant Tunneling Diode, Coulomb dots, Quantum blockade, Single electron transistors, Carbon nanotube electronics. **(9)**

UNIT V:
Band structure and transport, devices, applications, 2D semiconductors and electronic devices, Graphene, atomistic simulation. **(9)**

Course Outcomes:
At the end of the course, students will demonstrate the ability to:
1. Understand various aspects of nano-technology and the processes involved in makingnano components and material.
2. Leverage advantages of the nano-materials and appropriate use in solving practical problems.
3. Understand various aspects of nano-technology and theprocessesinvolved in making nano components and material.
4. Leverage advantages of the nano-materials and appropriate use in solving practical problems.

Text / Reference Books:

1. G.W. Hanson, Fundamentals of Nanoelectronics, Pearson,2009.
2. W. Ranier, Nanoelectronics and Information Technology (Advanced Electronic Materialand Novel Devices), Wiley-VCH,2003.
3. K.E. Drexler, Nanosystems, Wiley,1992.
4. J.H. Davies, The Physics of Low-Dimensional Semiconductors, Cambridge University Press,1998.
5. C.P. Poole, F. J. Owens, Introduction to Nanotechnology, Wiley,2003

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Open Elective- IV

18ECE304 WIRELESS SENSOR NETWORKS

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description:
This course introduces the concept of Wireless Sensor Network (WSN) to the students. It articulates the classification of WSN and related issues & challenges. It also describes different types of routing, MAC, dissemination protocols and explains design principles of wireless sensor networks.

Course Objectives:
1. Understand the concept of WSN, issues and challenges, classification of WSN.
2. Analyze and learn the classification of routing and MAC protocols.
3. Understand Dissemination protocol for large sensor network.
4. Design principles of WSNs.
5. Learn the hardware components & design constraints and Operating systems used in WSNs.

UNIT I
Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks. Mobile Ad-hocNetworks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks. **(9)**

UNIT II
Routing protocols, MAC protocols: Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee. **(9)**

UNIT III
Dissemination protocol for large sensor network. Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols. **(9)**

UNIT IV
Design Principles for WSNs, Gateway Concepts Need for gateway, WSN to Internet Communication, and Internet to WSN Communication. **(9)**

UNIT V
Single-node architecture, Hardware components& design constraints. Operating systems and execution environments, introduction to TinyOS and nesC. **(9)**

Course Outcomes:
At the end of the course the students will be able to
1. Understand the technologies related to Wireless PAN and Wireless LANs.
2. Summarize key Technologies of Wireless Broadband
3. Interpret features and challenges for WSN.
4. Analyze problems and design issues of various Routing protocols in WSN.
5. Apply the localization mechanisms in WSN.

Text/Reference Books:

1. WaltenegusDargie , Christian Poellabauer, " Fundamentals Of Wireless Sensor Networks Theory And Practice" , By John Wiley & Sons Publications ,2011
2. SabrieSoloman, " Sensors Handbook" by McGraw Hill publication. 2009
3. Feng Zhao, Leonidas Guibas, " Wireless Sensor Networks", Elsevier Publications,2004
4. Kazem Sohrby, Daniel Minoli, " Wireless Sensor Networks": Technology, Protocols and Applications, Wiley-Inter science.
5. Philip Levis, And David Gay "TinyOS Programming" by Cambridge University Press 2009

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Discipline Elective – I

Discipline Elective – I

18CST401 DATA MINING AND DATA WAREHOUSING

L	T	P	C
3	0	0	3

Course Prerequisite: 18CST105

Course Description:

In this course we explore how this interdisciplinary field brings together techniques from databases, statistics, machine learning, and information retrieval. We will discuss the main data mining methods currently used, including data warehousing and data cleaning, clustering, classification, association rules mining, and web mining.

Course Objectives:

1. To understand the fundamentals of Data mining and Pre-processing techniques
2. To understand the concept of Data warehouses.
3. To understand the algorithms of supervised techniques.
4. To understand the algorithms of unsupervised techniques.
5. To know the applications of data mining in the real world.

UNIT I INTRODUCTION TO DATA MINING

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation, role of Data warehousing in Data mining.
(9)

UNIT II MINING FREQUENT PATTERNS

Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining **(9)**

UNIT III CLASSIFICATION AND PREDICTION

Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Backpropagation, Lazy Learners, Other Classification Methods, Prediction, Accuracy and Error measures, Evaluating the accuracy of a Classifier or a Predictor, Ensemble Methods. **(9)**

UNIT IV CLUSTER ANALYSIS

Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis. **(9)**

UNIT V APPLICATIONS IN DATA MINING

Social networks Analysis, Web mining, Text mining, Multimedia. **(9)**

Course Outcomes:-

1. Student is able to preprocess any real world dataset by using preprocessing techniques
2. Able to distinguish the OLTP and OLAP.
3. Able to implement data mining techniques such as Associations, classification.
4. Able to implement clustering techniques and its applications.
5. Students can identify the applications where data mining techniques can be applied.

Textbook:

1. Tan, Pang-Ning& others. “Introduction to Data Mining” Pearson Education, 2006.

References:

1. Han J &Kamber M, “Data Mining: Concepts and Techniques”, Morgan Kaufmann Publishers,Second Edition, 2006
2. Dunhum M.H. & Sridhar S. “Data Mining-Introductory and Advanced Topics”, Pearson Education, 2006.
3. Grigoris Antoniou and Frank van Harmelen “A Semantic Web Primer”, The MIT Press Cambridge, Massachusetts London, England 2003.
4. S. Sumathi& S.N. Sivanandam “Introduction to Data mining and its applications”, Springer-verlag

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective - I

18CST402 MOBILE COMPUTING

L	T	P	C
3	0	0	3

Course Prerequisite: 18CST109

Course Description:

This course will give you an understanding of mobile and wireless network systems such as 2G/3G/4G mobile telephony/data networks, and other wireless networks and infrastructure devices. Wireless hosts e.g. mobile phones, laptops, as well as wireless links are becoming increasingly popular, hence there is the need to investigate the principles and protocols that make wireless communications possible.Bluetooth and 802.11 standards are among the topics to be discussed, as well as applications for the mobile phone.

Course Objectives:

1. Identify the necessity of wireless communication.
2. Understand the layered protocol architecture of wireless network.
3. Recognize the different types of WLANs and Define GSM and its evolution from telecommunication to wireless communication.
4. Understand Wireless Medium Access Control Protocols and Differentiate the network and transport protocols used in wired and wireless networks.
5. Define Database Issues and Data Dissemination and Synchronization and Understand the different Routing Protocols used in MANETs

UNIT I INTRODUCTION TO MOBILE COMMUNICATION AND COMPUTING

Introduction to Mobile Communications and Computing: Mobile Computing (MC) : Introduction to MC, Novel applications, Limitations, and Architecture. GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services. **(9)**

UNIT II MEDIUM ACCESS CONTROL

(Wireless) Medium Access Control (MAC): Motivation for a Specialized MAC (Hidden and Exposed Terminals, Near and Far Terminals), SDMA, FDMA, TDMA, CDMA, MAC Protocols for GSM. **(9)**

UNIT III MOBILE NETWORK LAYER

Mobile IP Network Layer: Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery,agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP). **(9)**

UNIT IV MOBILE TRANSPORT LAYER

Mobile Transport Layer: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fastretransmit/fast recovery, Transmission/ time-out freezing, Selective retransmission, Transactionoriented TCP. **(9)**

UNIT V PROTOCOLS AND TOOLS

Bluetooth (user scenarios-architecture-Radiolayer-Baseband layerLink manager protocol-L2CAPSecurity- SDA-Profiles). Wireless application protocol(architecture-wieless datagram protocol-wireless transport layer security-Wireless session protocol-wireless application environment-wireless markup language). **(9)**

Course Outcomes:

Upon completion of this course, students should be able to:

1. Discuss the basic concept of Mobile Communications and Computing.
2. Demonstrate the medium access control techniques.
3. Illustrate the functionalities of network layer protocols.
4. Interpret the generalized principles of mobile transport layer.
5. Analyze the working mechanism of different wireless application protocols.

Textbooks:

1. "Handbook of Wireless Networks and Mobile Computing", Stojmenovic and Cacute,Wiley, 2002.

2. "Mobile Communications", Jochen Schiller, Addison-Wesley, Second Edition, 2004.

References:

1. "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", Reza Behravanfar, Cambridge University Press, Oct2004.
2."Mobile Computing", Raj Kamal, Oxford University Press ,2007.
3. "Mobile and Wireless Design Essentials", MartynMallick, Wiley DreamTech, 2003.
4. "Principles of Mobile Computing", Hansmann, Merk, Nicklous, Stober, 2nd edition, Springer 2003.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective - I

18CST403 ARTIFICIAL INTELLIGENCE

L	T	P	C
3	0	0	3

Course Prerequisite: Nil

Course Description:

Includes an introduction to artificial intelligence as well as current trends and characterization of knowledge-based systems. They will cover simple representation schemes, problem-solving paradigms, constraint propagation, and search strategies. Areas of application such as knowledge representation, natural language processing and expert systems will be explored.

Course Objectives:

1. To learn the difference between optimal reasoning vs human like reasoning
2. To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities
3. To learn different knowledge representation techniques
4. To understand the applications of Al: namely Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing.

UNIT I

Foundations of artificial intelligence (AI). History of AI; Problem Solving- Formulating problems, problem types, states and operators, state space, search strategies. Scope of AI - Games, theorem proving, natural language processing, vision and speech processing, robotics, expert systems, AI techniques- search knowledge, abstraction. Informed Search Strategies- Best first search, A* algorithm, heuristic functions, Iterative deepening A*(IDA), small memory A*(SMA); Game playing - Perfect decision game, imperfect decision game, evaluation function, alpha-beta pruning **(9)**

UNIT II

Planning- Basic representation of plans, partial order planning, planning in the blocks world, hierarchical planning, conditional planning, representation of resource constraints, measures, temporal constraints. Introduction, Approaches to Knowledge Representation. Inference, Propositional Logic, predicate logic (first order logic), logical reasoning, forward chaining, backward chaining; Proof Systems, Natural Deduction, Tableau Method, Resolution Method. First Order Logic (FOL), Syntax and Semantics, Unification, Forward Chaining. The Rete Algorithm, Rete example, Programming Rule Based Systems. **(9)**

UNIT III

Representation in FOL, Categories and Properties, Reification, Event Calculus. Conceptual Dependency (CD) Theory, Understanding Natural Language. Deductive Retrieval, Backward Chaining, Logic Programming with Prolog.Resolution Refutation in FOL, FOL with Equality, Complexity of Theorem Proving. **(9)**

UNIT IV

Uncertainty - Basic probability, Bayes rule, Belief networks, Default reasoning, Fuzzy sets and fuzzy logic; Decision making- Utility theory, utility functions, Decision theoretic expert systems. **(9)**

UNIT V

Inductive learning - decision trees, rule based learning, current-best-hypothesis search, least-commitment search, neural networks, reinforcement learning, genetic algorithms; Other learning methods - neural networks, reinforcement learning, genetic algorithms. **(9)**

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Possess the ability to formulate an efficient problem space for a problem expressed in English.
2. Possess the ability to select a search algorithm for a problem and characterize its time and space complexities.
3. Possess the skill for representing knowledge using the appropriate technique.
4. Possess the ability to apply Al techniques to solve problems of Game Playing, Expert Systems, Machine Learning and Natural Language Processing.
5. Evaluate applications and background algorithms used for their implementation.

Textbooks:

1. Stuart Russell and Peter Norvig. Artificial Intelligence – A Modern Approach, Pearson Education Press, 2001.
2. Kevin Knight, Elaine Rich, B. Nair, Artificial Intelligence, McGraw Hill, 2008.
3. George F. Luger, Artificial Intelligence, Pearson Education, 2001.
4. Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kauffman, 2002.

References:

1. George F. Luger, "AI-Structures and Strategies for Complex Problem Solving", 4/e, 2002, Pearson Education.
2. Robert J. Schalkolf, Artificial Intelligence: An Engineering approach, McGraw Hill, 1990.
3. Patrick H. Winston, Artificial Intelligence, 3rd edition, Pearson.
4. Nils J. Nilsson, Principles of Artificial Intelligence, Narosa Publication.
5. Dan W. Patterson, Introduction to Artificial Intelligence and Expert System, PHI.
6. Elaine Rich, Kevin Knight, Artificial Intelligence, Tata McGraw Hill, 1999.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective - I

18CST404 WEB TECHNOLOGIES

L	T	P	C
3	0	0	3

Course Prerequisite: 18CST104

Course Description:

This course will expose students to the techniques used in programming web pages for interactive content. The course begins by reviewing basic web technologies (HTML, CSS style sheets) and exploring the use of event-driven programming in JavaScript to add interactive elements such as buttons and text fields to web pages. Next, students will use AJAX tools to build web pages that connect to servers like Google to dynamically access data (maps, search results, videos, images, etc). Finally, the course will show students how to write their own xml code to provide access to a custom database.

Course Objectives:

1. To introduce Markup Languages for client side scripting
2. To introduce JavaScript and DOM and Java Servlets with Java
3. To introduce XML and processing of XML Data with Java
4. To introduce Server side programming with Java Servlets and JSP
5. To introduce various java web services and SOAP

UNIT I WEB ESSENTIALS

Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols -The World Wide Web-HTTP request message-response message-Web Clients Web Servers-Case Study. Markup Languages: XHTML. An Introduction to HTML History-Versions-Basic XHTML Syntax and Semantics-Some Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-Forms-XML Creating HTML Documents-Case Study. **(9)**

UNIT II STYLE SHEETS

Style Sheets: CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML Style Rule Cascading and Inheritance-Text Properties-Box Model-Normal Flow Box Layout-Beyond the Normal Flow-Other Properties-Case Study. Client-Side Programming: The JavaScript Language-History and Versions Introduction to JavaScript in Perspective-Syntax-Variables and Data Types-Statements-Operators-Literals-Functions-Objects-Arrays-Built-in Objects - JavaScript Debuggers. **(9)**

UNIT III HOST OBJECTS

Host Objects: Browsers and the DOM-Introduction to the Document Object Model DOM History and Levels-Intrinsic Event Handling-Modifying Element Style-The Document Tree-DOM Event Handling-Accommodating Noncompliant Browsers Properties of window-Case Study. Server-Side Programming: Java Servlets- Architecture -Overview-A Servelet-Generating Dynamic Content-Life Cycle- Parameter Data-Sessions-Cookies- URL Rewriting-Other Capabilities-Data Storage Servlets and Concurrency-Case Study- Related Technologies. **(9)**

UNIT IV REPRESENTING WEB DATA

Representing Web Data: XML-Documents and Vocabularies-Versions and Declaration-Namespaces JavaScript and XML: Ajax-DOM based XML processing Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data: XPATH-Template based Transformations: XSLT-Displaying XML Documents in Browsers-Case Study-Related Technologies. Separating Programming and Presentation: JSP Technology-Introduction-JSP and Servlets-Running JSP Applications Basic JSP-JavaBeans Classes and JSP-Tag Libraries and Files-Support for the Model-View-Controller Paradigm-Case Study-Related Technologies. **(9)**

UNIT V WEB SERVICES

Web Services: JAX-RPC-Concepts-Writing a Java Web Service-Writing a Java Web Service Client-Describing Web Services: WSDL- Representing Data Types: XML Schema-communicating Object Data: SOAP Related Technologies-Software Installation-Storing Java Objects as Files-Databases and Java Servlets. **(9)**

Course Outcomes:

1. Gain knowledge of client side scripting, validation of forms and AJAX programming
2. Have understanding of server side scripting with JSP language
3. Have understanding of what is XML and how to parse and use XML Data with Java
4. To introduce Server side programming with Java Servlets and JSP

Text Book:

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.

REFERENCES:

1. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, PearsonEducation, 2007 .
2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", ThirdEdition, Pearson Education, 2006.
3. Marty Hall and Larry Brown,"Core Web Programming" Second Edition, Volume I andII, Pearson Education, 2001.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective - I

18CST405 DIGITAL IMAGE PROCESSING

L	T	P	C
3	0	0	3

Course Prerequisite: Nil

Course Description:

It begins with an introduction to the fundamentals of digital images and discusses the various discrete transforms, which are extensively used in image processing. It then goes on to discuss the different image processing techniques such as image enhancement, automatic image classification and recognition.

Course Objectives:

1. To Learn fundamentals of Digital image.
2. To be exposed to simple image processing techniques.
3. To Learn to represent image in the form of features.
4. To be familiar with the image compression and segmentation.

UNIT 1 FUNDAMENTALS OF IMAGE PROCESSING

Introduction, origin, step in digital image processing, Digital image representation, Image Sensing and Acquisition, Image sampling and quantization, Basic relation between pixels. **(9)**

UNIT II IMAGE ENHANCEMENT

Spatial domain: Gray level transformations, Histogram processing, Basics of spatial filtering, smoothing, sharpening, Combining spatial enhancement methods.

Frequency domain: Basics of filtering, Fourier transform, smoothing, sharpening, frequency domain filtering-Ideal, butterworth and Gaussian filters, Homomorphic filtering. **(9)**

UNIT III IMAGE RESTORATION AND SEGMENTATION

Noise models: Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Mean and median Filters, order statistics, adaptive filters, band reject filters, band pass filters, notch filters, noise filters, Constrained Least Squares Restoration, wiener filtering.

Segmentation: fundamentals, point, line and edge detection, Detection of discontinuities, boundary detection, region-based segmentation, morphological processing, erosion and dilation. The hit or Miss transformation. **(9)**

UNIT IV COMPRESSION AND MORPHOLOGICAL IMAGE PROCESSING

Need for image compression, classification of redundancy, Image compression models(schemes), Error Free Compression, Huffman and Arithmetic coding, pixel coding, entropy coding, run-length coding, bit plane coding, predictive coding Delta and DPCM techniques. Lossy Compression, Lossy and Lossless Predictive Coding, Zonal versus threshold coding. **(9)**

UNIT V COLOR IMAGE PROCESSING

Color image fundamental, color image models, pseudo color image processing, color models conversion, Image segmentation based on color. **(9)**

Course Outcomes:

At the end of the course, students will be able to:

1. Have an appreciation of the fundamentals of Digital image processing including the topics of filtering, transforms and morphology and image analysis and compression.
2. Be able to implement basic image processing algorithms in MATLAB
3. Have the skill base necessary to further explore advance d topics of Digital Image Processing.
4. Be in a position to make a positive professional contribution in the field of Digital Image Processing.
5. At the end of the course the student should have a clear impression of the breadth and practical scope of digital image processing and have arrived at a level of understanding that is the foundation for most of the work currently underway in this field.

Textbooks:

1. Digital Image Processing – Rafael C. Gonzalez, Richard E. Woods, 3rd Edition, Pearson, 2008
2. Digital Image Processing- S Jayaraman, S Esakkirajan, T Veerakumar- TMH, 2010.

Reference Books

3. Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools – ScotteUmbaugh, 2nd Ed, CRC Press, 2011
4. Digital Image Processing using MATLAB — Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, 2nd Edition, TMH, 2010.
5. Fundamentals of Digital Image Processing — A.K.Jain, PHI, 1989
6. Digital Image Processing and Computer Vision — Somka, Hlavac, Boyle- Cengage Learning (Indian edition) 2008.
7. Introductory Computer Vision Imaging Techniques and Solutions- Adrian low, 2008, 2nd Edition
8. Introduction to Image Processing & Analysis — John C. Russ, J. Christian Russ, CRC Press, 2010.
9. Digital Image Processing with MATLAB &Labview — Vipula Singh, Elsevie r.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective – I

18CST406 MULTIMEDIA TECHNOLOGIES

L	T	P	C
3	0	0	3

Course Prerequisite: Nil

Course Description:

This course aims to introduce the students to Multimedia technologies and their usage in real world applications. This course covers introduction to multimedia, different image, video and audio formats, image coding and compression techniques, I/O technologies, Multimedia network and Multimedia Security and Forensics.

Course Objectives:

1. To provide the foundation knowledge of multimedia computing.
2. To provide the knowledge about media characteristics, compression standards, multimedia representation, data formats, multimedia technology development.
3. To understand Multimedia security and forensics.

UNIT I INTRODUCTION TO MULTIMEDIA TECHNOLOGIES

Introduction to Multimedia: Multimedia Elements – Multimedia applications – Multimedia System Architecture – Evolving technologies for Multimedia – Defining objects for Multimedia systems – Multimedia Data interface standards – Multimedia Databases. **(9)**

UNIT II COMPRESSION AND FILE FORMATS

Compression and Decompression: Need for Data Compression – Types of Compression – Binary Image Compression Schemes – Image Compression – Video Compression – Audio Compression. Data and File Format Standards: Rich Text Format – TIFF File Format – Resource Interface File Format – MIDI File Format - JPEG DIB File Format – AVI Indeo File Format – MPEG Standards – TWAIN. **(9)**

UNIT III MULTIMEDIA I/O TECHNOLOGIES

Input and Output Technologies: Multimedia I/O Technologies: Image Scanners – Digital Voice and Audio – Digital Camera – Video Images and Animation – Full Motion Video -Video Motion Analysis. **(9)**

UNIT IV MULTIMEDIA NETWORKS

Protocol - QOS Issues - RTP, RTCP, RTSP, SIP - Media on demand –ITV - STB Broadcast Schemes for VoD Buffer Management- Multimedia over wireless networks. **(9)**

UNIT V MULTIMEDIA SECURITY AND FORENSICS

Multimedia encryption - Digital Watermarking Security Attacks- Digital Forensics taxonomy, goals/requirements - Forensic Data Acquisition -Forensics Analysis and Validation. **(9)**

Course Outcomes:

Upon completion of this course, students should be able to

1. Understand the characteristics of different media and the representations of different multimedia data formats.
2. Understand the characteristics of Image, Audio and Video systems and takes into considerations in multimedia techniques design and implementation.
3. Describe different coding and compression principles and compare different compression techniques.
4. Design multimedia components efficiently
5. Develop integrated, collaborative multimedia systems

Textbooks:

1. K. Andleigh, KiranThakrar , Multimedia Systems Design, PHI, 2007
2. ZeNian Li, S. Drew, “Fundamentals of Multimedia”, PHI, 2006
3. Li, Ze-Nian and Mark S. Drew, “Fundamentals of Multimedia”, Prentice Hall of India, 2004.
4. Steinmetz Ralf and K. Nahrstedt “Multimedia: Computing, Communications & Applications”, Pearson Education, 1995.

Reference Books:

1. Ralf Steinmetz and Klara, “Multimedia Computing, Communications and Applications”, Pearson Education, 2009
2. Min Wu, Bede Liu, “Multimedia Data Hiding”, Springer-Verlag, 2002
3. I. Cox, M. Miller, and J. Bloom, "Digital Watermarking", Morgan Kaufman Publishers, 2001
4. Chun-Shien Lu, “Multimedia Security : Steganography and Digital Watermarking techniques for Protection of Intellectual Property”, Springer Inc 2007
5. WenjunZeng, Heather Yu and Ching, Yung Lin, “Multimedia Security technologies for Digital rights Management”, Elsevier Inc 2006

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective – I

18CST430 GAME DEVELOPMENT

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:

The course introduces the concepts of 3D Graphics for game design. The course will well prepare the students to learn processes, mechanics, issues in game design and enrich their experience in developing interactive games.

Course Objectives:

1. To realize the importance of 3D Graphics for game design.
2. To familiarize with the process of game design.
3. To learn the processes, mechanics, issues in game design.
4. To understand the architecture of game engines and gaming platforms.
5. To develop simple interactive games.

UNIT I 3D GRAPHICS FOR GAME DEVELOPMENT

Coordinate systems, 3D Graphics, Modeling, Curves and Surfaces. Vertex Processing, Rasterization, Fragment Processing, Output merging, Image Texturing. Illumination and shaders, Rendering techniques. **(9)**

UNIT II GAME DESIGN PRINCIPLES

Games, Genres, Game worlds, Character Development, storytelling, creating user experience, Game Play, Core Mechanics, Game Balancing, Level Design, Collision Detection, Physics based Simulation, Game AI. **(9)**

UNIT III GAME ENGINE ARCHITECTURE AND ANIMATION

Game Engine Architecture, scene graphs, sorting, level of detail, Animation. **(9)**

UNIT IV GAME DEVELOPMENT

Understanding UNITY environment, scripting, sprite animations. character development, collision detection, physics, level design and fine tuning **(9)**

UNIT V DEMONSTRATION OF GAME PROJECTS

Implementing and demonstrating Games designed and developed by students using standard tools. **(9)**

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Implement simple 3D Graphics applications for Game development.
2. Use core Game design principles for Game Design.
3. Analyze Game Engine Architecture and rendering.
4. Design simple animations.
5. Use tools modern like UNITY for Game design and development.

Text Book(s)

1. Jung Hyun Han, “3D Graphics for Game Programming”, Delmar Cengage Learning, 2011

2. Buttfield-Addison, P., Manning, J., & Nugent, T. (2019). Unity game development cookbook: essentials for every game. O'Reilly Media.

Reference Books

1. Ernest Adams, “Fundamentals of Game Design”, 3rd Edition, Pearson Education, 2015.

2. Murray, J. W. (2020). Building Virtual Reality with Unity and SteamVR. CRC Press.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Discipline Elective – I

18CST431 DATABASE TUNING

L	T	P	C
3	0	0	3

Pre-requisite **18CST103**

Course Description:

The course introduces the concepts of 3D Graphics for game design. The course will well prepare the students to learn processes, mechanics, issues in game design and enrich their experience in developing interactive games.

Course Objectives:

1. To comprehend the basic principles of database tuning
2. To understand the basics of backup and recovery techniques
3. To comprehend the principles of query optimization
4. To understand the principles of E-commerce application

UNIT I INTRODUCTION TO TUNNING

Review of Relational databases-Relational Algebra -Transaction Management- Locking and concurrency control- Lock Tuning. **(9)**

UNIT II RECOVERY TUNNING

Recovery Subsystem – Principles of Backup and Recovery – Tuning the Recovery Subsystem – Operating Systems Considerations – Hardware Tuning **(9)**

UNIT III TUNING RELATIONAL SYSTEMS

Introduction to Tuning Relational Systems – Normalization –Denormalization – Clustering Two Tables – Aggregate Maintenance – Record Layout – Query Tuning **(9)**

UNIT IV TUNING APPLICATION

Analyzing a Query's Access Plan – Profiling a Query Execution – DBMS Subsystems – Data Warehousing Tuning. Tuning E-Commerce Applications – E-Commerce Architecture – Tuning E-Commerce Architecture -Transaction Chopping **(9)**

UNIT V DATABASE TUNING

Time Series Databases – Understanding Access Plans – Configuration, Parameters – Distributed DB Implementation **(9)**

Course Outcomes:

Upon successful completion of the course, students will be able to
1. Point out the significance of database tuning
2. Identify suitable backup and recovery techniques
3. Optimize queries for tuning databases
4. Tune E-Commerce applications

5. Point out the significance of time series

Text Book

1. Dennis Shasha and Philippe Bonnet, "Database Tuning, Principles, Experiments, and Troubleshooting Techniques", Morgan Kaufmann, An Imprint of Elsevier, 2003.
2. Thomas Connoly and Carlolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Third Edition, Pearson Education, 2003.

Reference Books

1. Niemiec, R. (2017). Oracle Database 12c Release 2 Performance Tuning Tips & Techniques. McGraw Hill Professional.
2. Silberschatz, A., Korth, H. F., & Sudarshan, S. (2018). Database System Concepts 6th ed.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective – III

Discipline Elective - III

18CST407 SOFT COMPUTING

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description:

Soft computing is an emerging approach to computing which parallel the remarkable ability of the human mind to reason and learn in an environment of uncertainty and imprecision. Soft computing is based on some biological inspired methodologies such as genetics, evolution, ant's behaviors, particles swarming, human nervous systems, etc. Now, soft computing is the only solution when we don't have any mathematical modeling of problem solving (i.e., algorithm), need a solution to a complex problem in real time, easy to adapt with changed scenario and can be implemented with parallel computing. It has enormous applications in many application areas such as medical diagnosis, computer vision, hand written character recondition, pattern recognition, machine intelligence, weather forecasting, network optimization, VLSI design, etc.

Course Objectives:

To give students knowledge of soft computing theories fundamentals,

1. To learn the fundamentals of non-traditional technologies and approaches to solving hard real-world problems.
2. To learn and apply artificial neural networks, fuzzy sets and fuzzy logic, and genetic algorithms in problem solving and use of heuristics based on human experience.
3. To introduce the ideas of fuzzy sets, fuzzy logic To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems.
4. To familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations.

UNIT I NEURAL NETWORKS - I

Introduction and Architecture: Neuron, Nerve Structure and Synapse, Artificial Neuron and its Model, Activation Functions, Neural Network Architecture: Single Layer and Multilayer Feed Forward Networks, Recurrent Networks. Various Learning Techniques; Perception and Convergence Rule, Auto-Associative and Hetro-Associative Memory. **(9)**

UNIT II NEURAL NETWORKS - II

Back Propagation Networks: Architecture: Perceptron Model, Solution, Single Layer Artificial Neural Network, Multilayer Perception Model; Back Propagation Learning Methods, Effect of Learning Rule Co-Efficient ;Back Propagation Algorithm, Factors Affecting Back Propagation Training, Applications. **(9)**

UNIT III FUZZY LOGIC - I

Introduction: Basic Concepts of Fuzzy Logic, Fuzzy Sets and Crisp Sets, Fuzzy Set Theory and Operations, Properties of Fuzzy Sets, Fuzzy and Crisp Relations, Fuzzy to Crisp Conversion.

(9)

UNIT IV FUZZY LOGIC – II

Fuzzy Membership, Rules: Membership Functions, Interference in Fuzzy Logic, Fuzzy If-Then Rules, Fuzzy Implications and Fuzzy Algorithms, Fuzzifications and Defuzzificataions, Fuzzy Controller, Industrial Applications. **(9)**

UNIT V GENETIC ALGORITHM Basic Concepts, Working Principle, Procedures of GA, Flow Chart of GA, Genetic Representations, (Encoding) Initialization and Selection, Genetic Operators, Mutation, Generational Cycle, Applications. **(9)**

Course Outcomes:

Upon completion of the course, the students will be able to:

1. Awake the importance of tolerance of imprecision and uncertainty for design of robust and low-cost intelligent machines.
2. Acquire knowledge of soft computing theories fundamentals.
3. Design program systems using approaches of these theories for solving various real-world problems.
4. Try and integrate the knowledge of neural networks, fuzzy logic, genetic algorithms, probabilistic reasoning, rough sets, chaos, hybrid approaches (combinations of neural networks, fuzzy logic and genetic algorithms).

Textbooks:

1. S. Rajasekaran and G.A. VijayalakshmiPai, ―Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, Prentice Hall of India, 2003.
2. N.P.Padhy, Artificial Intelligence and Intelligent Systems‖, Oxford University Press, 2005.
3. J.S.R. Jang, C.T. Sun and E. Mizutani, ―Neuro-Fuzzy and Soft Computing, Pearson Education, 2004.

References:

1. SimanHaykin, ―Neural Networks, Prentice Hall of India, 1999
2. Timothy J. Ross, ―Fuzzy Logic with Engineering Applications, Third Edition, Wiley India, 2010.
3. S.Y.Kung, ―Digital Neural Network, Prentice Hall International, 1993.
4. Aliev.R.A and Aliev,R.R, ― Soft Computing and its Application, World Scientific Publishing Company, 2001.
5. Wulfram Gerstner and WennerKristler, ―Spiking Neural Networks, Cambridge University Press.
6. Bart Kosko, ―Neural Networks and Fuzzy Systems: Dynamical Systems Application to Machine Intelligence‖, Prentice Hall, 1992.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective – III

18CST408 REAL TIME SYSTEMS

L	T	P	C
3	0	0	3

Course Prerequisite: 18CST109

Course Description:

To introduce the fundamental problems, concepts, and approaches in the design and analysis of real-time systems. To study issues related to the design and analysis of systems in communication, database with real-time constraints.

Course Objectives:

1. To provide good understanding of fundamental concepts in real time systems.
2. To understand on basic multi-task scheduling algorithms for periodic, aperiodic, and sporadic tasks.
3. To learn the programming language tools for real time systems.
4. Acquire knowledge on real time communications and databases.

UNIT I INTRODUCTION

Introduction-Issues in Real Time Computing, Structure of a Real Time System. Task Classes, Performance Measures for Real Time Systems, Estimating Program Run times. **(9)**

UNIT II TASKASSIGNMENTAND SCHEDULING

Task Assignment and Scheduling-Classical Uniprocessor scheduling algorithms, UniProcessor scheduling of IRIS Tasks, Task Assignment, Mode Changes, and Fault Tolerant Scheduling. **(9)**

UNIT III PROGRAMMINGLANGUAGESAND TOOLS

Programming Language and Tools –Desired Language characteristics, Data Typing, Control structures, Facilitating Hierarchical Decomposition, Packages, Run-time (Exception) Error handling, Overloading and Generics, Multitasking, Low Level programming, Task scheduling, Timing Specifications, Programming Environments, Run-time Support. **(9)**

UNIT IV REALTIMEDATABASES

Realtime Databases- Basic Definition, Realtime Vs General Purpose Databases, Main Memory Databases, Transaction priorities, Transaction Aborts, Concurrency Control Issues, Disk Scheduling Algorithms, Two-phase Approach to improve Predictability, Maintaining Serialization Consistency, Databases for Hard Real Time systems. **(9)**

UNIT V REAL TIME COMMUNICATION

Real-Time Communication - Communications Media, Network Topologies Protocols, Fault Tolerant Routing. Fault Tolerance Techniques- Fault Types, Fault Detection. Fault Error containment Redundancy, Data Diversity, Reversal Checks, Integrated Failure handling. **(9)**

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand the basics and importance of real-time systems
2. Analyze the real time system based on requirements specifications
3. Understand basic multi-task scheduling algorithms for periodic, aperiodic, and sporadic tasks as well as understand the impact of the latter two on scheduling
4. Understand requirement of database systems for real time systems
5. Learn the requirement of communication systems for real time systems

Textbook:

1. C.M. Krishna, Kang G. Shin, "Real-Time Systems", McGraw-Hill International Editions, 2010.

References:

1. Stuart Bennett, "Real Time Computer Control-An Introduction", Second edition Perntice Hall PTR, 1994.
2. Peter D. Lawrence, "Realtime Micro Computer System Design– An Introduction", McGraw Hill, 1988.
3. S.T.Allworth and R.N. Zobel, "Introduction to realtime software design", Macmillan, IIEdition, 1987.
4. R.J.ABuhur, D.L.Bailey, "An Introduction to Real-Time Systems", Prentice-Hall International, 1999.
5. Philip. A. Laplante, "Real Time System Design and Analysis" PHI, III Edition, April 2004

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective - III

18CST409 PRINCIPLES OF INFORMATION SECURITY

L	T	P	C
3	0	0	3

Course Prerequisite: 18CST109

Course Description:

This course provides a broad overview of information systems security in organizations. Topics include security concepts and mechanisms; mandatory and discretionary controls; basic cryptography and its applications; intrusion detection and prevention; information systems assurance; and anonymity and privacy. Various types of controls used in information systems, as well as security issues surrounding the computer and computer-generated data, are also addressed.

Course Objectives:

The importance of Information Security

1. Legal and ethical issues of Information Security
2. Various Security Technologies to protect Information against threats
3. Systematic Project Management to ensure Security in an Organization

UNIT I INTRODUCTION TO INFORMATION SECURITY

Introduction – The History of Information Security – What Is Security? – Components of an Information System – Security in the Systems Life Cycle. The Need for Security : Introduction - Threats and Attacks –Technical Hardware Failures or Errors - Technical Software Failures or Errors **(9)**

UNIT II LEGAL, ETHICAL, AND PROFESSIONAL ISSUES IN INFORMATION SECURITY

Introduction – Law and Ethics in Information Security- Relevant U.S. Laws – International Laws and Legal Bodies – Ethics and Information Security – Codes of Ethics at Professional Organizations. Risk Management: Introduction – An Overview of Risk Management– Risk Identification – Risk Assessment – Risk Control. **(9)**

UNIT III PLANNING FOR SECURITY

Introduction - Information Security Planning and Governance - Information Security Policy, Standards, and Practices – The Information Security Blueprint – Security Education, Training, and Awareness Program. Security Technology: Firewalls and VPNs: Introduction – Access Control – Firewalls – Protecting Remote Connections. **(9)**

UNIT IV SECURITY TECHNOLOGY

Intrusion Detection and Prevention Systems, and Other Security Tools : Introduction – Intrusion Detection and Prevention Systems – Honeypots, Honeynets, and Padded Cell Systems – Scanning and Analysis Tools. Cryptography: Cipher Methods – Cryptographic Algorithms **(9)**

UNIT V IMPLEMENTING INFORMATION SECURITY

Introduction – Information Security Project Management – Technical Aspects of Implementation – Nontechnical Aspects of Implementation – Information Systems Security Certification and Accreditation. Information Security Maintenance: Introduction – Digital Forensics **(9)**

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand the basics concepts of information security.
2. Discuss the legal, ethical, and professional issues in information security.
3. Apply the security policies and planning methodologies.
4. Analyse the tools and methods for securing digital information system.
5. Apply information security concepts in project management.

Text Book:

1. Michael E.Whitman and Herbert J.Mattord .2015. Principles of Information Security. [FifthEdition] Cengage Learning India Private Limited, Delhi.
2. Smith, Richard E. Elementary information security. Jones & Bartlett Learning, 2019.

References:

1. Calabrese. 2006. Information Security Intelligence: Cryptographic Principles and Applications. [India Edition]. Thomson Delmar Learning Publications.
2. Bhaskar, S.M. and Ahson. S.I. 2008. Information Security – A Practical Approach. Narosa Publishing House, New Delhi

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective – III

18CST410 ADHOC WIRELESS NETWORKS

L	T	P	C
3	0	0	3

Course Prerequisite: 18CST109

Course Description:

The course provides a comprehensive understanding of the Adhoc Wireless Networks and it is an advanced research-oriented course designed for graduate students with computer networks background. It will cover various topics relevant to a cutting-edge technology, namely, Ad hoc Wireless Networks, which include MAC protocols, designing routing protocols and working of Table-Driven Routing protocols, On-Demand Routing protocols, designing Transport layer Protocols for Ad-hoc networks and designing Security Protocols for Adhoc networks. Through this course, students can learn the state of art of wireless ad hoc networks research, and enhance their potential to do research in this exciting area.

Course Objectives:

This course will enable students to

1. List and Explain the various issues and applications of Ad hoc wireless networks.
2. Classify and Explain the working of MAC protocols for Ad-hoc wireless networks
3. Discuss the issues in designing routing protocols and working of Table-Driven Routing protocols.
4. Compare and contrast the working of various On-Demand Routing protocols.
5. Analyze the challenges in designing Transport layer Protocols for Ad-hoc networks , Compare and contrast the working of Transport protocols.
6. Identify the issues in designing Security Protocols for Adhoc networks focusing on the workingperformance of security protocols.

UNIT I AD-HOC WIRELESS NETWORKS

Introduction, Issues in Ad-hoc Wireless Networks, Ad-hoc Wireless Internet; MAC Protocols for Ad-hoc Wireless Networks: Introduction, Issues in Designing a MAC Protocol, Design Goals of MAC Protocols, Classification of MAC protocols, Contention-Based Protocols, Contention-Based Protocols with Reservation Mechanisms, Contention-Based Protocols with Scheduling Mechanisms. **(9)**

UNIT II ROUTING PROTOCOLS FOR AD-HOC WIRELESS NETWORKS

Introduction, Issues in Designing a Routing Protocol for Ad-hoc Wireless Networks; Classification of Routing Protocols; Table Driven Routing Protocols; On-Demand Routing Protocols, Hybrid Routing Protocols, Hierarchical Routing Protocols and Power-Aware Routing Protocols. **(9)**

UNIT III MULTICAST ROUTING IN AD-HOC WIRELESS NETWORKS

Introduction, Issues in Designing a Multicast Routing Protocol, Operation of Multicast Routing Protocols, An Architecture Reference Model for Multicast Routing Protocols, Classifications of Multicast Routing Protocols, Tree-Based Multicast Routing Protocols and Mesh-Based Multicast Routing Protocols. **(9)**

UNIT IV TRANSPORT LAYER PROTOCOLS FOR AD-HOC NETWORKS

Introduction, Issues in Designing a Transport Layer Protocol; Design Goals of a Transport Layer Protocol; Classification of Transport Layer Solutions; TCP over Transport Layer Solutions; Other Transport Layer Protocols for Ad-hoc Networks. **(9)**

UNIT V SECURITY IN AD-HOC WIRELESS NETWORKS

Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management and Secure Routing Ad-hoc Wireless Networks. **(9)**

Course Outcomes:

Upon successful completion of the course, students will be able to:

1. Design their own wireless network
2. Evaluate the existing network and improve its quality of service
3. Design multicasting Routing Protocol.
4. Choose appropriate protocol for various applications
5. Examine security measures present at different level

Textbook:

1. C. Siva Ram Murthy & B. S. Manoj: Ad-hoc Wireless Networks, 2nd Edition, Pearson Education, 2011

References:

1. Ozan K. Tonguz and Gianguigi Ferrari: Ad-hoc Wireless Networks, John Wiley, 2007.
2. Xiuzhen Cheng, Xiao Hung, Ding-Zhu Du: Ad-hoc Wireless Networking, Kluwer Academic Publishers, 2004.
3. C.K. Toh: Ad-hoc Mobile Wireless Networks- Protocols and Systems, Pearson Education,2002

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective – III

18CST411 SERVICE ORIENTED ARCHITECTURE

L	T	P	C
3	0	0	3

Course Prerequisite: Nil

Course Description:

This course covers Introduction to SOA (Service Oriented Architecture) and Evaluation of SOA systems. The student considers SOA which defines and provisions IT infrastructure and allows for a loosely-coupled data exchange over disparate applications participating in business processes. It also covers the XML basic and its applications. Student also can know about SOA base web services, business process design and Enterprise platform-based services.

Course Objectives:

1. Understand introduction and Evolution of SOA.
2. To learn about Service orientation Principals.
3. To know about XML basic and able build XML based application.
4. To learn about SOA and related webservices.
5. **To** know about business process design and Enterprise platform.

Unit 1INTRODUCTION TO SOA, EVOLUTION OF SOA

Fundamental SOA; Common Characteristics of contemporary SOA; Common tangible benefits of SOA; An SOA timeline (from XML to Web services to SOA); The continuing evolution of SOA (Standards organizations and Contributing vendors); The roots of SOA (comparing SOA to Past architectures). **(9)**

Unit II SERVICE ORIENTATION PRINCIPAL

Services-orientation and the enterprise; Anatomy of a service-oriented architecture; Common Principles of Service-orientation; Service orientation and Object-orientation; Service layer abstraction; Business service layer; Orchestration service layer; **(9)**

Unit III XML BASIC, BUILDING XML BASED APPLICATION

XML document structure – Well-formed and valid documents – Namespaces – DTD – XML Schema – X-Files. Parsing XML – using DOM, SAX – XML Transformation and XSL – XSL Formatting – Modeling Databases in XML. **(9)**

Unit IV SOA AND WEB SERVICES

The Web services framework; Services (as Web Services); Service Registry; Service descriptions (with WSDL); Messaging (with SOAP), Transactions, Coordination, Business Activity, Orchestration, Choreography; Addressing, Reliable Messaging, Policies, Metadata, Security, Notification and Events; Semantic Web Services; RESTful Services. **(9)**

Unit V BUSINESS PROCESS DESIGN AND ENTERPRISE PLATFORM

Business Process Management basics; WS-BPEL language basics; WS-Coordination overview; Service oriented business process design; WS-addressing language basics; WS-Reliable Messaging language basics; Service Component Architecture basics, SOA platform basics; Enterprise Service Bus basics (including basic and complex patterns) **(9)**

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand software-oriented architectures
2. Design medium scale software project development using SOA principles
3. Develop SOA messages from business use cases
4. Students should have a detailed knowledge of the basic issues in translators.
5. Design and implementation of modern SOA and SOA-specific methodologies, technologies and standards.
6. Create composite services by applying composition style.

Textbooks:

1. Service-Oriented Architecture Concepts and Technology and Design-Thomas Erl, Pearson Education, 2005.
2. Understanding SOA with Web Services – Eric Newcomer, Greg Lomow, Pearson Education, 2005.
3. Developing Enterprise Web Services – An Architect's Guide – SandeepChatterjee, James Webber Pearson Education, ISBN 81-297-0491-9.
4. Michael Rosen, Boris Lublinsky, Applied SOA Service Oriented Architecture and Design Strategies, Wiely India Edition, 2008.

References:

1. T Architecture and Middleware, Strategies for Building Large Integrated Systems, Chris Britton, ISBN 0-201-70907-4.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective - III

18CST412 E-LEARNING TECHNOLOGIES

L	T	P	C
3	0	0	3

Course Prerequisite: Nil

Course Description:

The course provides a comprehensive understanding of the fundamental theory of E-learning and the Strategies of E-Learning .The relation between Models of E-Learning and Multi/Hyper Media for E-learning has been explained across various stages of learning techniques.

Course Objectives:

1. To enable the students to understand the concept of e-learning and integrating the technology.
2. To inculcate knowledge in planning the role of information technology in virtual classroom and university.
3. To make the students to understand the technology mediated communication and its applications.
4. To include knowledge in planning models of E-learning in in virtual classroom and university.
5. To make the students to understand the future of E-learning technology and its development.

UNIT I CONCEPT OF E-LEARNING

Meaning, Evolution of E-Learning – Components of E-Learning – Virtual classroom: Teleconferencing, Audio and Video conferencing. **(9)**

UNIT II STRATEGIES OF E-LEARNING

Process of E-Learning: Knowledge Acquisition and Creation, Sharing of Knowledge, Utilization of Knowledge – E-Learning Instructional Grounds: Behaviourism, Cognitivism and Constructivism. **(9)**

UNIT III MODELS OF E-LEARNING

Role of Web-Based Instruction in Learning – Models of WBI: Instructional Design Model (ISD) & Hyper Media Design Model (HMD) – Computer Languages for Designing WBI – Future of E-Learning. **(9)**

UNIT IV MULTI/HYPER MEDIA FOR E-LEARNING

Concept, Meaning, Characteristics and Applications – Teaching Techniques through Multi/Hyper Media – Multimedia & Learning – Multimedia for Co-operative and Collaborative Learning Strategies – General Guidelines for Multi/Hyper Media Applications – Advantages & Disadvantages of Multi/Hyper Media. **(9)**

UNIT V FUTURE OF E-LEARNING TECHNOLOGY

21stCentury Education – Challenges of Distance Education – Electronic Media in Distance Education – Open Educational Resources / Open Learning – Internet in Distance Education – Virtual University System.E-Patashala, Indian Institutes Developing E-Content. **(9)**

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand the concept of e-learning and integrating the technology.
2. Make the students to understand the technology mediated communication and its applications.
3. Understand the technology mediated communication and its applications.
4. Include knowledge in planning models of E-learning in in virtual classroom and university.
5. Make the students to understand the future of E-learning technology and its development.

Textbooks:

1. Badrul Khan and Mohamed Ally(Edited), 2015, International Hand book of E-Learning:Volume-1 Theoretical Perspectives and Research, Routledge,.

2. Robyler , 2007, Integrating Educational Technology into Teaching, 4th Edition, Pearson Education India .

3. Richard Andrews and Caroline Heythornthwaite (Edited), 2007, The SAGE Hand Book of E-Learning Research, SAGE,Delhi.

References

1. Bryn Holmes and John Gardiner, 2006,E-Learning Concepts and Practice, ,Pine Forge Press.

2. Y.R. Ramaiah , 2002,Distance Education and Open Learning, , Mittal Publications.
3. PradeepMandav, 2001, Visual Media Communication, Authorspress.

4. Michael D.Wiliams, Prentice Hall, 2000,Integrating Technology into Teaching and Learning: Concepts and Applications,.

5. Laura Parker Roerden, O'Reilly, 1997,Net Lessons: Web-based Projects for Your Classroom, Volume 1.

6. Paul F. Merrill, Allyn and Bacon, 1996,Computers in Education, 3rd Edition.
7. Joan Riedl, Allyn and Bacon, 1995,The Integrated Technology Classroom.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective - III

18CST432 MODELING AND SIMULATION

L	T	P	C
3	0	0	3

Pre-requisite **None**

Course Description:

The course provides a comprehensive understanding of the fundamental theory modelling and simulation. The relation between modelling and simulation of data and provides different aspect of queuing and data analysis models in various stages.

Course Objectives:

1. To obtain knowledge and make decisions of any given system.
2. To simulate the modeled system for performance study of an actual system.
3. To reflect the continuing evolution of simulation software.
4. To understand the statistical models in simulation.
5. To acquire skills on analysis of simulation data.

UNIT I INTRODUCTION TO MODELING AND SIMULATION

System modeling - Simulation examples - Types and concepts, Modeling concurrent systems ,Finite State Automata and Regular expressions **(9)**

UNIT II STATISTICAL MODELS IN SIMULATION & SOFTWARE

Terminology and concepts – Useful statistical models – Discrete distributions – Continuous Distributions, Selection of simulation software – Simulation in C++ - Simulation in GPSS – Simulation packages **(9)**

UNIT III QUEUEING MODELS

Characteristics of queueing systems – Notations – Long run measures of performance of queueing systems - Markovian models **(9)**

UNIT IV RANDOM NUMBER GENERATION

Random number properties - Generation of pseudo random numbers - Techniques for generating random Numbers, Inverse transform techniques – Exponential distribution – Uniform distribution – Weibull distribution – Triangular distribution **(9)**

UNIT V ANALYSIS OF SIMULATION DATA

Problem formulation – Input modeling – Verification and validation of simulation models, simulation tools – Model input – High level computer system simulation **(9)**

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Model any given system with rationality
2. Predict the behavior through fine grained analysis
3. Identify the important aspects of discrete event simulation
4. Apply the modeling and simulation concepts to manufacturing, services and computing
5. Verify and validate simulation modelsoint out the significance of database tuning

Text Books

1. Hopcroft, John E, Motwani, Rajeev, Ullman, Seffrey D, “Introduction to automata theory, languages and computation”, Pearson Education Limited, 3rd Edition, 2013.
2. GeoFfrey Gordon “System Simulation”, Prentice Hall of India, 2nd Edition, 2009.

Reference Books

1. Fitzgerald, Jhon, Larsen,PeterGorm, “Modelling Systems; Practical Tools and Techniques in software development”, Cambridge University Press, 2nd Edition, 2009.
2. Law A.M, Simulation Modelling and Analysis, Tata Mc Graw Hill, 4th Edition, 2007

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Discipline Elective - III

18CST433 SOFTWARE TEST AUTOMATION

L	T	P	C
3	0	0	3

Pre-requisite: **18CST112**

Course Description:

The course introduces the concepts of test automation. The course will well prepare the students to learn automation using selenium web driver and IDE.

Course Objectives:

1. To gain insight into test automation
2. To learn tools for web testing
3. To learn web driver scripting
4. To handle exceptions in test automation
5. To understand the procedure of automating software tests

UNIT I INTRODUCTION TO AUTOMATION

Automation lifecycle and Automation goals - Test Automation Frameworks – Types – Types of Automation Tools **(9)**

UNIT II AUTOMATION USING SELENIUM I

Selenium IDE – Selenium versions and their capabilities - Selenium Test scripting – Cucumber Behavior Driven Development, Selenium Web Driver – Web Elements – Interactions and Features of Web Driver – Web Driver, Events – Remote Web Driver **(9)**

UNIT III AUTOMATION USING SELENIUM II

Functional web testing: using Twill, using Selenium - Testing simple web applications with Twill and Selenium, Selenium web driver based test automation frameworks – selenium WebDriver scripting. **(9)**

UNIT IV SELENIUM IDE

Test NG scripting – Test Automation Results Management – Selenium Exceptions Guide, Selenium Grid - Selenium IDE, Selenium IDE scripting – Advanced Selenium IDE. **(9)**

UNIT V AUTOMATION FRAMEWORK

Selenium Web Driver Page Object Model – Selenium Automation Framework in Agile Projects, Testing iOS and Android Apps **(9)**

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Conduct automated software testing
2. Test a web application using Selenium
3. Test a web application using Twill
4. Understand selenium POM
5. Learn testing iOS and Android applications

Text Books

1. Sandeep Desai & Abhishek Srivatsava, “Software Testing : A Practical Approach”, PHI Learning Pvt. Ltd, 2016, Second Edition
2. Satya Avasarala, “Selenium WebDriver Practical Guide”, Packt Publishing Ltd, 2014

Reference Books

1. Narayanan Palani, “Software Automation Testing Secrets Revealed” Revised Edition Part 1, Educreation Publishing, 2017 Edition.
2. Narayanan Palani, “Selenium Webdriver: Software Automation Testing Secrets Revealed”, Part 2, Educreation Publishing, 2016 Edition.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective – IV

Dept. of Computer Science & Technology

Discipline Elective – IV

18CST413 MACHINE LEARNING

L	T	P	C
3	0	0	3

Pre-requisite **None**

Course Description:

The course introduces the concepts of machine learning algorithms various types of real world problem. The course will well prepare the students to understand and analysis the performance of machine learning algorithms and support vector machine and enhance their experience in solving real world problems.

Course Objectives:

1. To understand the need for machine learning for various types of problem solving
2. To know the mathematics involved in various machine learning algorithms
3. To study the various supervised, semi-supervised and unsupervised learning algorithms in machine learning
4. To analyse about support vector machine in machine learning
5. To implement latest developments of machine learning in real-world applications.

UNIT I INTRODUCTION

Learning – Types of Machine Learning – Supervised Learning - The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning- Concept Learning task – Concept Learning as Search - Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm **(9)**

UNIT II NEURAL NETWORKS &MULTI-LAYER PERCEPTRON

Neural Networks – Perceptron – Linear Separability – Linear Regression, The Multi-Layer Perceptron – Back Propagation of Error-Multi-layer Perceptron in Practice – Deriving Back Propagation – Applications of MLP **(9)**

UNIT III RBF NETWORKS & DIMENSIONALITY REDUCTION

Radial Basis Function Network - Concepts –Training - Interpolation and Basis Functions – Solutions using RBF. Dimensionality Reduction –Linear Discriminant Analysis-Principal Component Analysis-Factor Analysis-Independent Component Analysis-Locally Linear Embedding-Isomap **(9)**

UNIT IV SUPPORT VECTOR MACHINE

Optimal Separation-Kernels-Choosing kernels-The Support Vector Machine Algorithm-Implementation and Examples-Extensions to the SVM: Multi-Class Classification, SVM regression. **(9)**

UNIT V EVOLUTIONARY LEARNING

Evolutionary Learning-The Genetic Algorithm-Genetic Operators-Using Genetic Algorithms-Genetic Programming – Applications **(9)**

Course Outcomes:

Upon successful completion of the course, students will be able to
1. Understand Supervised learning Concept.
2. Discuss Neural networks and Multi layer Perceptron
3. Interpret the concept of Dimensionality Reduction
4. Apply Kernals of Support Vector Machine in classification and regression problems
5. Explain Genetic algorithm with its applications

Text Books

1. Stephen Marsland, "Machine Learning – An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
2. Tom M Mitchell, "Machine Learning", McGraw Hill Education, 2013.

Reference Books

1. Ethem Alpaydin, "Introduction to Machine Learning", Third Edition, Adaptive Computation and Machine Learning Series, MIT Press, 2014.
2. Jason Bell, "Machine learning – Hands on for Developers and Technical Professionals", First Edition, Wiley, 2014.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective – IV

18CST414 SOCIAL NETWORK ANALYSIS

L	T	P	C
3	0	0	3

Pre-requisite None

Course Description:

The course introduces the concepts of 3D Graphics for game design. The course will well prepare the students to learn processes, mechanics, issues in game design and enrich their experience in developing interactive games.

Course Objectives:

1. To understand the concept of semantic web and related applications
2. To represent knowledge using ontology
3. To understand human behavior insights in social networks
4. To learn about the extraction and mining tools for social networks
5. To visualize social networks

UNIT I INTRODUCTION & GRAPH ESSENTIALS

Introduction to Social Network Analysis –Graph Essentials –Graph Basics – Graph Representation Types of Graphs – Connectivity in Graphs – Special Graphs – Graph Algorithms. **(9)**

UNIT II NETWORK MEASURES & MODELS

Network Measures: Centrality, transitivity and reciprocity, similarity – Network Models: Properties of Real-World Networks – Random Graphs – Small World Model – Preferential Attachment Model **(9)**

UNIT III SEMANTIC WEB AND ONTOLOGY

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web. Ontology and their role in the Semantic Web: Ontology-based knowledge Representation – Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language. **(9)**

UNIT IV COMMUNITIES AND INTERACTIONS

Community Detection-Community Evolution-Community Evaluation-Information Diffusion in Social Media-Herd Behavior-Information Cascades-Diffusion of Innovations-Epidemics. **(9)**

UNIT V EVOLUTIONARY LEARNING

Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations -Applications - Cover networks – Community welfare - Collaboration networks - Co-Citation networks. **(9)**

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand and appreciate the concept of semantic web
2. Represent knowledge using ontology
3. Design extraction and mining tools for social networks
4. Visualize social networks and infer social parameters from the same
5. Apply the analytics concept on Online Social networks

Text Books

1. R. Zafarani, M. Abbasi, and H. Liu,"Social Media Mining: An Introduction", Cambridge University Press, 2014.
2. Peter Mika, "Social networks and the Semantic Web", Springer, 1st edition 2007.

Reference Books

1. Colleen McCue, "Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis", Elsevier, 2nd edition, 2015.
2. Guandong Xu,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", Springer, 1st edition, 2011.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective - IV

18CST415 CRYPTOGRAPHY AND NETWORK SECURITY

Course Prerequisite: 18CSIT112

L	T	P	C
3	0	0	3

Course Description:

We cover in this course principles and practice of cryptography and network security: classical systems, symmetric block ciphers (DES, AES, other contemporary symmetric ciphers), linear and differential cryptanalysis, perfect secrecy, public-key cryptography (RSA, discrete logarithms), algorithms for factoring and discrete logarithms, cryptographic protocols, hash functions, authentication, key management, key exchange, signature schemes, email and web security, viruses, firewalls, digital right management, and other topics.

Course Objectives:

1. Understand the fundamental principles of access control models and techniques, authentication and secure system design.
2. Have a strong understanding and describe of different cryptographic protocols and techniques be able to use them.
3. Become knowledgeable in various methods and protocols to maintain E-mail security, and web security.
4. Analyze & develop methods for authentication, access control, intrusion detection and prevention.
5. Identify and mitigate software security vulnerabilities in existing systems.

UNIT I: SYMMETRIC CIPHERS

Introduction: Security Attacks, Services & Mechanisms, A Model for Network security. Symmetric Key Cryptography: Classical encryption techniques, Block cipher operations, DES, AES. **(9)**

UNIT II: ASYMMETRIC CIPHERS

Introduction: Modular arithmetic (addition, multiplication, inverse, exponentiation) Public key Cryptography principles, RSA: generating keys, encryption and decryption. Other Public-key cryptosystems: Diffie-Hellman **(9)**

UNIT III: CRYPTOGRAPHY AND DATA INTEGRITY ALGORITHMS:

Applications of Cryptographic Hash functions, Secure Hash Algorithm., Message Authentication Requirements & Functions, Requirements for MAC, HMAC, Digital Signatures, NIST Digital Signature Algorithm **(9)**

UNIT IV: MUTUAL TRUST

Key management and Distribution: Symmetric key distribution using Symmetric and Asymmetric encryption, Distribution of public keys, Kerberos X.509 certificates, Public-Key Infrastructure. **(9)**

UNIT V: NETWORK AND INTERNET SECURITY

Transport level security: Web security issues, Secure Socket Layer (SSL), Transport Layer Security (TLS),HTTPS, E-mail Security: PGP,S/MIME, IP Security: IP Security Overview, IP Security Policy **(9)**

Course Outcomes:

Upon completion of this course, students should be able to:

1. Interpret the principles of Symmetric key cryptography.
2. Discuss modular arithmetic in public key cryptography.
3. Demonstrate various cryptographic techniques for data integrity.
4. Examine various secure key distribution and authentication mechanisms.
5. Relate the protocols for secure data transmission and communication.

Textbooks:

1. Stallings, W.,.Cryptography and Network Security: Principles and Practice, 5th ed., Prentice Hall PTR.,2011.
2. Cryptography and Network Security; 2nd ed. , Behrouz A. Forouzan , Debdeep Mukhopadhyay, McGraw Hill,2011.

References:

1. AtulKahate, Cryptography and Network Security, 2nd ed., Tata Mcgraw Hill education Private Limited, 2011.
2. Computer Security, Dieter Gollman,3rded, Wiley Publications,2011.
3. Introduction to Computer Security, Matt Bishop,1sted,Addison-Wesley Proffesional,2004.
4. Hand Book of Applied Cryptography, by Alfred Menezes, Paul van Oorschot, Scott Vanstone, CRC-Press 1996.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Discipline Elective - IV

18CST416 ADVANCED ALGORITHMS

L	T	P	C
3	0	0	3

Pre-requisite **None**

Course Description:

The course introduces the concepts fundamental design, analysis, and implementation of basic data structures. The course will well prepare the students to learn principles for good program design, especially the uses of data abstraction and enrich their experience in developing algorithm for real-world application.

Course Objectives:

1. To understand the fundamental design, analysis, and implementation of basic data structures.
2. To analysis of programs.
3. To learn the principles for good program design, especially the uses of data abstraction.
4. To analysis the significance of algorithms in the computer field
5. Create the algorithm for real-world application.

UNIT I INTRODUCTION

Role of algorithms in computing, Analyzing algorithms, Designing Algorithms, Growth of Functions, Divide and Conquer- The maximum-subarray problem, Strassen's algorithms for matrix multiplication, The substitution method for solving recurrences, The recurrence-tree method for solving recurrence, The master method for solving recursions, Probabilistic analysis and random analysis. **(9)**

UNIT II REVIEW OF DATA STRUCTURES

Elementary Data Structures, Hash Tables, Binary Search Trees, Red-Black Trees. **(9)**

UNIT III DYNAMIC PROGRAMMING

Matrix-chain multiplication, Elements of dynamic programming, Longest common subsequence, Greedy Algorithms – Elements of the greedy strategy, Huffman codes, Amortized Analysis – Aggregate analysis, The accounting method, The potential method, Dynamic tables. **(9)**

UNIT IV GRAPH ALGORITHMS

Elementary Graph Algorithms, Minimal spanning trees, Single-Source Shortest Paths, Maximum flow. **(9)**

UNIT V NP PROBLEMS

Complete & Approximate Algorithms-Polynomial time, Polynomial-time verification, NP-completeness and reducibility, NP-complete & approximation problems – Clique problem, Vertex cover problem, formula satisfiability, 3 CNF Satisfiabilty, The vertex-cover problem, The traveling salesman problem, The subset-sum problem. **(9)**

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand fundamental design, analysis, and implementation of basic data structures
2. Basic concepts in the specification and analysis of programs.
3. principles for good program design, especially the uses of data abstraction
4. Analysis the significance of algorithms in the computer field
5. Apply the analysis concept in developing new algorithms.

Text Books

1. "Introduction to Algorithms", Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Third Edition, PHI Publication.
2. "Data Structures and Algorithms in C++", M.T. Goodrich, R. Tamassia and D.Mount, Wiley India.

Reference Books

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Second Edition, Galgotia Publication
2. Data structures and Algorithm Analysis in C++, 3rd edition, M. A. Weiss, Pearson.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Discipline Elective - IV

18CST417 BLOCKCHAIN AND CRYPTOCURRENCY

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:

The course introduces the concepts of Bitcoin and Cryptocurrency and its applications in Blockchain Technology. The course will well prepare the students to verify and validate the Bitcoin Transaction and enrich their experience in practical polices associated with bitcoin business.

Course Objectives:

1. To understand the mechanism of Blockchain and Cryptocurrency.
2. To understand the functionality of current implementation of blockchain technology.
3. To understand the required cryptographic background.
4. To explore the applications of Blockchain to cryptocurrencies and understanding
5. limitations of current Blockchain.
6. An exposure towards recent research.

UNIT I INTRODUCTION TO CRYPTOGRAPHY AND CRYPTOCURRENCIES

Cryptographic Hash Functions, Hash Pointers and Data Structures, Digital Signatures, Public Keys as Identities, A Simple Cryptocurrency. **(9)**

UNIT II BITCOIN ACHIEVES DECENTRALIZATION & MECHANICS

Decentralization-Centralization vs. Decentralization-Distributed consensus, Consensus with- out identity using a blockchain, Incentives and proof of work. Bitcoin transactions, Bitcoin Scripts, Applications of Bitcoin scripts, Bitcoin blocks, The Bit- coin network, Limitations and improvements. **(9)**

UNIT III BITCOIN MINING

The task of Bitcoin miners, Mining Hardware, Energy consumption and ecology, Mining pools, Mining incentives and strategies. Simple Local Storage, Hot and Cold Storage. **(9)**

UNIT IV BITCOIN ANONYMITY & REGULATION

Anonymity Basics, How to De-anonymize Bitcoin, Mixing, Decentralized Mixing, Zerocoin and Zerocash. Consensus in Bitcoin, Roots of Bitcoin, Governments Notice on Bitcoin, Anti Money Laundering Regulation. **(9)**

UNIT V ALTCOINS AND THE CRYPTOCURRENCY ECOSYSTEM

Altcoins: History and Motivation, A Few Altcoins in Detail, Relationship Between Bitcoin and Altcoins, Merge Mining-Atomic Crosschain Swaps-6 BitcoinBacked Altcoins, Side Chains, Ethereum and Smart Contracts, Applications. **(9)**

Course Outcomes:

Upon successful completion of the course, students will be able to

1. To Understand and apply the fundamentals of Cryptography in Cryptocurrency.
2. To gain knowledge about various operations associated with the life cycle of Blockchain and Cryptocurrency.
3. To deal with the methods for verification and validation of Bitcoin transactions.
4. To demonstrate the general ecosystem of several Cryptocurrency
5. To educate the principles, practices and policies associated Bitcoin business.

Text Book(s)

1. Narayanan, A., Bonneau, J., Felten, E., Miller, A., and Goldfeder, S. (2016). Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press.
2. G. B. Thomas, Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas' Calculus Pearson education 11th Edition, 2004.

Reference Books

1. Antonopoulos, A. M. (2014). Mastering Bitcoin: unlocking digital cryptocurrencies. OReilly Media, Inc.".
2. Franco, P. (2014). Understanding Bitcoin: Cryptography, engineering and economics. John Wiley and Sons.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective - V

Dept. of Computer Science & Technology

Discipline Elective - V

18CST418 BIG DATA ANALYTICS

L	T	P	C
3	0	0	3

Course Prerequisite: Nil

Course Description:
This course introduces fundamental concepts and tools required to understand Data analytics. The also discusses big data applications in Data Science and covers the applications and technologies needed to process the large-scale data.

Course Objectives:

1. To learn data mining and big data basics
2. To learn the big data in technology perspective
3. To learn Hadoop framework for data analytics
4. Applying MapReduce paradigm to solve problems
5. To interpret the potential applications in big data scenario.

UNIT I INTRODUCTION TO DATA MINING AND BIG DATA
Introduction to Data mining, KDD process, Data Mining Techniques: Mining Frequent patterns, Association rule, Cluster analysis, Classification and Regression. Introduction to Big Data - What is Big Data? Explosion in Quantity of Data, Big Data Characteristics, Types of Data, Common Big data Customer Scenarios, BIG DATA vs. HADOOP, A Holistic View of a Big Data System, Limitations of Existing Data Analytics Architecture. **(9)**

UNIT II DATA ANALYTICS LIFE CYCLE
Introduction to Big data Business Analytics - State of the practice in analytics role of data scientists-Key roles for successful analytic project - Main phases of life cycle - Developing core deliverables for stakeholders. **(9)**

UNIT III INTRODUCTION TO HADOOP
Hadoop Distribution, Hadoop Key Characteristics, RDBMS vs. Hadoop, Hadoop 2.x Cluster Architecture, Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands, Anatomy of File Write and Read. Name Node, Secondary Name Node, and Data Node, Hadoop 2.0 New Features – Name Node High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN Hadoop Distributed File System. **(9)**

UNIT IV PROGRAMMING FOR DATA ANALYTICS
MapReduce program in Java – Map Reduce API – Programming Examples- Combiner Functions Streams and Files - Streams – Text Input and Output – Reading and Writing Binary Data. **(9)**

UNIT V DATA SCIENCE AND APPLICATIONS
Data Loading Techniques & Data Analysis, Text Analytics for Large unstructured information, Analytic Stack, Big Data Applications - Fraud detection in Stock markets, Sentiment Analysis. **(9)**

Course Outcomes:

At the end of the course, students will be able to:

1. Interpret big data and its analytics in the real world problems.
2. Understand the Data Analytics life cycle.
3. Understand the functionalities of Hadoop framework.
4. Apply Map reduce programming techniques on Big Data.
5. use of big data applications to solve real..

Textbooks:

1. Jiawei Han MichelineKamber Jian Pei, Data Mining: Concepts and Techniques, Third Edition, Elsevier, Morgan Kaufmann, 2011.
2. Tom White, “Hadoop: The Definitive Guide”, 3rd Edition, O’reilly, 2012.
3. Alberto Cordoba, “Understanding the Predictive Analytics Lifecycle”, Wiley, 2014.
4. Eric Siegel, Thomas H. Davenport, “Predictive Analytics: The Power to Predict Who WillClick, Buy, Lie, or Die”, Wiley, 2013.

References:

1. Chuck Lam ,Hadoop in Action, Manning, Second Edition ,2016.
2. Mark Gardener, Beginning R: The Statistical Programming Language, Wiley, 2013.
3. Jiawei Han and MichelineKamber, Data Mining, Second Edition, Elsevier, 2007. ISBN: 81-312-0535-5.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Discipline Elective - V

18CST419 TEST DRIVEN DEVELOPMENT

L	T	P	C
3	0	0	3

Pre-requisite **18CST112, 18CST433**

Course Description:

This course introduces fundamental concepts in test driven development. This also discusses tools used for unit testing, analysis the potential software for refactoring, TDD tools and framework.

Course Objectives:

1. To get insight into test driven development
2. To learn to use tools for unit testing in TDD
3. To identify potential regions for refactoring in a software application
4. To understand pattern based TDD
5. To gather ideas on TDD tools and framework.

UNIT I OVERVIEW OF TDD

Test Driven Development: Basics, Techniques in TDD, Importance of Test cases - The Money Example –xUnit - Refactoring by Example **(9)**

UNIT II TDD METHODS

Composing methods - moving features between objects – organizing data – simplifying conditional expressions – making method calls simpler – dealing with generalization **(9)**

UNIT III REFACTORING

Big refactoring – refactoring, reuse and reality – refactoring tools Patterns for TDD: TDD patterns – Red Bar patterns, testing patterns, green bar patterns **(9)**

UNIT IV DESIGN PATTERNS

Patterns for TDD: TDD patterns –xUnit Patterns, Design Patterns TDD Tools, Frameworks and Environments: Virtual Machines, IDE, Unit Testing Frameworks **(9)**

UNIT V TDD TOOLS

TDD Tools, Frameworks and Environments: Hamcrest and AssertJ, Code coverage tools, Mocking Frameworks TDD Tools, Frameworks and Environments: User-Interface testing, Behavior-driven development(BDD) **(9)**

Course Outcomes:

Upon completion of the course, the students will be able to:

1. To learn working with JUnit
2. To identify bad smells in code
3. To understand and apply refactoring tools
4. To apply Red-green TDD patterns
5. To learn to use various code-coverage tools

Text Book(s)

1. Bala Paranj, “Test Driven Development in Ruby: A Practical Introduction to TDD Using Problem and Solution Domain Analysis”, Apress, 2017.
2. Fowler, Martin, “Refactoring: Improving the Design of Existing Code”, Addison-Wesley Professional, Year: 2018

Reference Books

1. Kent Beck, “Test-driven development: by example” Addison-Wesley Professional, 2003
2. Viktor Farcic& Alex Garcia, “Test-Driven Java Development”, Packt Publishing Ltd, 2015

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective - V

18CST420 AUGMENTED REALITY AND VIRTUAL REALITY

L	T	P	C
3	0	0	3

Pre-requisite None

Course Description:
This course aims to familiarize with hardware and software for augmented reality and virtual reality and its usage in building real-time application. This also discusses tools used for develop Augmented Virtuality and Mixed Reality applications.

Course Objectives:
To understand Virtual Reality
1. To Familiarize with hardware and software for AR and VR
2. To understand Augmented Reality
3. To develop Augmented Virtuality
4. To develop Mixed Reality applications

UNIT I INTRODUCTION & MULTIPLE MODALS OF INPUT AND OUTPUT INTERFACE IN VIRTUAL REALITY

Fundamental Concepts and Components of Virtual Reality. Primary Features and Present Development on Virtual Reality Input -- Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output -- Visual / Auditory / Haptic Devices. **(9)**

UNIT II ENVIRONMENT MODELING IN VIRTUAL REALITY & HAPTIC & FORCE INTERACTION IN VIRTUAL REALITY -1

Geometric Modeling; Behavior Simulation; Physically Based Simulation Concept of haptic interaction; Principles of touch feedback and force feedback. **(9)**

UNIT III HAPTIC & FORCE INTERACTION IN VIRTUAL REALITY - 2 & AUGMENTED REALITY -1

Typical structure and principles of touch/force feedback Facilities in applications. Introduction System Structure of Augmented Reality; Key Technology in AR, AR hardware, AR software, AR content. **(9)**

UNIT IV AUGMENTED REALITY -2 & AUGMENTED VIRTUALITY AND MIXED REALITY

General solution for calculating geometric & illumination Consistency in the augmented environment. Tracking, Calibration and registration, Computer vision visual coherence, situated visualization, modeling and annotation Authoring AR, navigation, Mobile AR, Augmented Virtuality, Mixed Reality. **(9)**

UNIT V MIXED REALITY DEVELOPMENT TOOLS & MIXED REALITY APPLICATION DEVELOPMENT

Frameworks of Software Development Tools in VR; Modeling Tools for VR, Planning, creating content for VR and AR projects Gaming and entertainment, Education, Science and Engineering, Information control and bigdata visualization. **(9)**

Course Outcomes:

Upon completion of the course, the students will be able to:

1. Point out the various user interaction modes
2. Design and Create user environment
3. Demonstrate VR through simple applications
4. Familiarity with Augmented Reality and Mixed Reality Development platforms
5. Use techniques to combine AR and VR to generate Augmented Virtuality
6. Implement simple mixed reality applications

Text Book(s)

1. Virtual Reality by Steve Lavalle, Cambridge University Press, 2016.
2. Steve Aukstakalnis , Practical Augmented Reality, A guide to technologies applications and human factors for AR and VR (usability), Addison-Wesley Professional, 1st Edition, 2016.

Reference Books

1. Paul Mealy, Virtual and Augmented Reality for Dummies, For Dummies, 1st Edition, 2018.
2. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.
3. Schmalstieg/Hollerer, Augmented Reality: Principles & Practice, Pearson Education India, 1st Edition, 2016.
4. Alan B. Craig, Understanding Augmented Reality: Concepts and Applications, Morgan Kaufmann, 1st Edition, 2013.
5. George Mather, Foundations of Sensation and Perception: Psychology Press; 2 edition,2009.
6. Kelly S. Hale, Kay M. Stanney, Handbook of Virtual Environments: Design, Implementation, and Applications, September 10, 2014 by CRC Press.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective - V

18CST421 WIRELESS NETWORK SYSTEM

Course Prerequisite: Nil

L	T	P	C
3	0	0	3

Course Descriptions:
Introduction to wireless communications and networking. Topics include transmission fundamentals, satellite and cellular networks, cordless systems, mobile IP and management, multiple access techniques and wireless protocols, wireless LAN, IEEE 802.11, and adhoc and sensor networks in 3G and 4G technologies.

Course Objectives:
1. To study about Wireless networks, protocol stack and standards.
2. To understand the characteristics of mobile network layers.
3. To understand the characteristics of mobile transport layers.
4. To study about fundamentals of 3G Services, its protocols and applications.
5. To study about evolution of 4G Networks, its architecture and applications.

UNIT I WIRELESS LAN
Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM,BRAN, HiperLAN2 – Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX. **(9)**

UNIT II MOBILE NETWORK LAYER
Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet- Mobile IP session initiation protocol - mobile ad-hoc network: Routing, Destination Sequence distance vector, Dynamic source routing. **(9)**

UNIT III MOBILE TRANSPORT LAYER
TCP enhancements for wireless protocols - Traditional TCP: Congestion control, fast retransmit/fast recovery, Implications of mobility - Classical TCP improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, Transaction oriented TCP - TCP over 3G wireless networks. **(9)**

UNIT IV WIRELESS WIDE AREA NETWORK
Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3G-MSC, 3GSGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High speed Downlink packet access (HSDPA)- LTE network architecture and protocol. **(9)**

UNIT V 4G NETWORKS
Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, OFDM-MIMO systems, Adaptive Modulation and coding with time slot scheduler, Cognitive Radio. **(9)**

Course Outcomes:
1. Identify the key technologies and standards in Wireless LANs.
2. Understand the functionality of Mobile IP and its components.
3. Understand the implications of mobility on traditional TCP.
4. Describe the architectures of UMTS and LTE networks.
5. Discuss the features and challenges of 4G networks.

Textbooks:
1. Jochen Schiller, ”Mobile Communications”, Second Edition, Pearson Education 2012.
2. Vijay Garg , “Wireless Communications and networking”, First Edition, Elsevier 2007.

References:
1. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband”, Second Edition, Academic Press, 2008.
2. Anurag Kumar, D.Manjunath, Joy kuri, “Wireless Networking”, First Edition, Elsevier 2011.
3. Simon Haykin , Michael Moher, David Koilpillai, “Modern Wireless Communications”, First Edition, Pearson Education 2013.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Discipline Elective - V

18CST422 PROGRAMMING PARADIGMS

L	T	P	C
3	0	0	3

Course Prerequisite: 18CST102

Course Description:
This course aims to introduce the students to the different programming language design principles. This course covers introduction to reasons to study programming languages and their syntax and semantics, variables and data types in the languages, expressions and control structures, subprograms, concurrency, exception handling mechanisms, logical programming and functional programming, scripting languages with python as case study.

Course Objectives:
1. To explore modern programming languages and the techniques used for programming.
2. To get an idea on evaluation of programming languages.
3. To analyze a given program from good programming practice perspective.

UNIT I INTRODUCTION
The art of Language design – Programming language spectrum - Compilation and Interpretation – Evaluation of Programming languages – Syntax and Semantics of Language C-lite - Names – Types – Type Systems - Binding – Scope – Static – Dynamic – Abstract Data types. **(9)**

UNIT II SEMANTICS
Expression – Assignment - Control Flow – Input/Output – Exception Handling – State Transformation – Partial Functions – Semantics with Dynamic Typing – Formal Treatment of Semantics. **(9)**

UNIT III FUNCTIONS
Call and Return – Parameter Passing – Function Declaration – Semantics Of Call and Return – Formal Treatment of Types and Semantics – Memory Management – Dynamic Arrays – Garbage Collection. **(9)**

UNIT IV PROGRAMMING TECHNIQUES
Imperative programming – C – ADA – Perl – Object Oriented Programming – Small Talk- Java– Python – Functional Programming – Scheme – Haskell **(9)**

UNIT V MODERN PROGRAMMING TECHNIQUES
Logic Programming – Prolog – Event-Driven programming – Concurrent Programming – Concepts – Synchronization Strategies – Language Level Mechanism - Interprocess COMMUNICATION – Scripting LANGUAGES. **(9)**

Course Outcomes:
Upon successful completion of the course, students will be able to

1. Write programs related to syntax and semantics.
2. Compare programs between C, Ada, Perl and Small Talk.
3. Write programs using scripting languages.
4. Demonstrate event-driven and concurrent programming using prolog.
5. Apply prolog for developing distributed systems.

Textbooks:

1. Allen B. Tucker and Robert E. Noonan, ―Programming Languages – Principles and Paradigms‖, Second Edition, Tata McGraw Hill, 2009.

References:

1. Robert W. Sebesta, ―Concepts of Programming Languages‖, Sixth Edition, Addison Wesley, 2003.
2. Michael L Scott, ―Programming Language Pragmatics‖, Third Edition, Morgan Kauffman, 2009.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Discipline Elective - V

18CST423 HUMAN COMPUTER INTERACTION

	L	T	P	C
Course Prerequisite: Nil	3	0	0	3

Course Description:
The course provides a comprehensive understanding of the fundamental theory of User Interface Design and the Multimedia applications. Human-computer interaction is an interdisciplinary field that integrates theories and methodologies from computer science, cognitive psychology, design, and many other areas. The course is intended to introduce the student to the basic concepts of human-computer interaction. It will cover the basic theory and methods that exist in the field.

Course Objectives:
1. Gain an overview of Human-Computer Interaction (HCI), with an understanding of user interface design.
2. Become familiar with the vocabulary associated with sensory and cognitive systems as relevant to task performance by humans.
3. Be able to apply models from cognitive psychology to predicting user performance in various human-computer interaction tasks and recognize the limits of human performance as they apply to computer operation.
4. Be familiar with a variety of both conventional and non-traditional user interface paradigms.
5. Gain an overview of Icons and Multimedia, with an understanding of user interface design.

UNIT I INTRODUCTION
Importance of user Interface: Definition, Importance of Good Design, Benefits of Good Design, A Brief History of Screen Design. The Graphical User Interface : Popularity of Graphics, the Concept of Direct Manipulation, Graphical System, Characteristics, Web User –Interface Popularity, Characteristics- Principles of User Interface. **(9)**

UNIT II DESIGN PROCESS
Understanding how people interact with computers, importance of human characteristics human consideration, Human interaction speeds, and understanding business functions. **Screen Designing**: Design goals–Screen meaning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information– Focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design **(9)**

UNIT III SYSTEM MENUS
Structures of Menus, Functions of Menus, Content of Menus, Kinds of Graphical menus Windows: Window characteristics, Components of a window, Window presentation styles, Types of windows, Window management. **(9)**

UNIT IV CONTROLS
Characteristics of device based controls, selecting the proper device based controls, Operable controls, Text Entry/Read-only controls, Selection controls, Combination Entry/selection controls, selecting the proper controls. **(9)**

UNIT V GRAPHICS
Icons, Multimedia, Colour-what is it, Colour uses, Colour and Human vision, Choosing colours Testing: The purpose and importance of usability testing, Scope of testing, Prototypes, Kinds of Tests, Developing and conducting the test. **(9)**

Course Outcomes:

At the end of the course students will be assessed to determine whether they are able to

1. Find innovative ways of interacting with computers
2. Help the disabled by designing non-traditional ways of interacting
3. Use cognitive psychology in the design of devices for interaction
4. Find the innovative ways of device based controls
5. Use modern technology of Graphics and multimedia tools.

Textbooks:

1. The essential guide to user interface design, Wilbert O Galitz, 2nd edition, 2013, Wiley.

Reference Books:

1. Designing the user interface, 3rd Edition Ben Shneidermann, Pearson Education Asia.
2. Human –Computer Interaction, D.R.Olsen, Cengage Learning.
3. Human – Computer Interaction, I.Scott Mackenzie, Elsevier Publishers.
4. Interaction Design, Prece, Rogers, Sharps, Wiley Dreamtech.
5. User Interface Design, SorenLauesen, Pearson Education.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective - VI

Discipline Elective – VI

18CST424 SOFTWARE DEFINED NETWORKING

L	T	P	C
3	0	0	3

Course Prerequisite: 18CST410

Course Description:
The objective of this course to learn about Software Defined Networking, an emerging Internet architectural framework, including the main concepts, architectures, algorithms, protocols and applications and related topics including Data centre Networks.

Course Objectives:
1. Understand about Software Defined Networking.
2. To learn about an emerging internet architectural framework.
3. Implement Programming SDNs and NFV.
4. To analyse Data centre networks.

UNIT I HISTORY AND EVOLUTION OF SOFTWARE DEFINED NETWORKING (SDN)
Separation of Control Plane and Data Plane, IETF Forces, Active Networking. Control and Data Plane Separation: Concepts, Advantages and Disadvantages, the Open Flow protocol. **(9)**

UNIT II NETWORK VIRTUALIZATION
Concepts, Applications, Existing Network Virtualization Framework (VMWare and others), Mininet based examples. **(9)**

UNIT III CONTROL AND DATA PLANE SEPARATION
Concepts, Advantages and Disadvantages, the OpenFlow protocol. Control Plane: Overview, Existing SDN Controllers including Floodlight and Open Daylight projects. Customization of Control Plane: Switching and Firewall Implementation using SDN Concepts. Data Plane: Software-based and Hardware-based; Programmable Network Hardware. **(9)**

UNIT IV PROGRAMMING SDNS AND NFV
Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs. Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications. **(9)**

UNIT V DATA CENTRE NETWORKS
Packet, Optical and Wireless Architectures, Network Topologies. Use Cases of SDNs: Data Centres, Internet Exchange Points, Backbone Networks, Home Networks, Traffic Engineering.
(9)

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Have a detailed knowledge on the topic software defined networking and Data centre networks.
2. Gain knowledge on Northbound Application Programming Interface and Network Functions Virtualization.

Textbooks:

1. SDN: Software Defined Networks, An Authoritative Review of NetworkProgrammability Technologies, By Thomas D. Nadeau, Ken Gray Publisher:O'Reilly Media, August 2013, ISBN: 978-1-4493-4230-2, ISBN 10:1-4493-4230-2.
2. Software Defined Networks: A Comprehensive Approach, by PaulGoransson and Chuck Black, Morgan Kaufmann, June 2014, Print BookISBN: 9780124166752, eBook ISBN : 9780124166844

References:

1. SDN and OpenFlow for Beginners by VivekTiwari, Sold by: AmazonDigital Services, Inc., ASIN:2013.
2. Network Innovation through OpenFlow and SDN: Principles and Design,Edited by Fei Hu, CRC Press, ISBN-10: 1466572094, 2014.
3. Open Networking Foundation (ONF) Documents,https://www.opennetworking.org, 2015.
4. OpenFlow standards, http://www.openflow.org, 2015.
5. Online Reading Lists, including:http://www.nec-labs.com/~lume/sdn-reading-list.html, 2015

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Discipline Elective – VI

18CST425 LARGE SCALE DATA PROCESSING

L	T	P	C
3	0	0	3

Pre-requisite **18CST418**

Course Description:

The course provides a comprehensive understanding of the fundamental theory of User Interface Design and the Multimedia applications. Human-computer interaction is an interdisciplinary field that integrates theories and methodologies from computer science, cognitive psychology, design, and many other areas. The course is intended to introduce the student to the basic concepts of human-computer interaction. It will cover the basic theory and methods that exist in the field.

Course Objectives:

1. To understand the different characteristics and requirement of big data frameworks.
2. To explain the concepts of distributed file system and Map Reduce programming.
3. To apply the exposure on inverted indexing and graph data analytic.

UNIT I NEED OF DATA ANALYTICS

Data Analytics Life Cycle Data Analytics in Industries Exploring Big data Challenges in handling Big Data. **(9)**

UNIT II BIG DATA TOOLS

Need of Big data tools - understanding distributed systems - Overview of Hadoop comparing SQL databases and Hadoop Hadoop Eco System - Distributed File System: HDFS, Design of HDFS writing files to HDFS Reading files from HDFS. **(9)**

UNIT III INTRODUCTION TO MAPREDUCE

Developing MapReduce Program Anatomy of MapReduce Code - Simple Map Reduce Pro- gram - counting things Map Phase shuffle and sort - Reduce Phase Master slave architecture Job Processing in hadoop Map Reduce Pipelining. **(9)**

UNIT IV MAPREDUCE PROGRAMMING CONCEPTS

Use of Combiner - Block vs Split Size - working with Input and output format Key,Text, Sequence, NLine file format, XML file format. **(9)**

UNIT V INVERTED INDEXING AND GRAPH ANALYTICS

Web crawling inverted index Baseline and revised implementation - Graph Representation Parallel Breadth first search page rank issues with graph processing. **(9)**

Course Outcomes:

At the end of the course students will be assessed to determine whether they are able to

1. Define the characteristics of big data and explain the data science life cycle.
2. Differentiate between conventional and contemporary distributed framework and Characterize storage and processing of large data.
3. Implement and demonstrate the use of the hadoop eco-system.
4. Compare scalable frameworks for large data.
5. Decompose a problem into map and reduce operations for implementation.
6. Design programs to analyze large scale text data.
7. Identify problems suitable for use of graph mining in large data processing

Text Book(s)

1. Tom White, Hadoop The Definitive Guide, O"Reilly, 4th Edition, 2015
2. Alex Holmes, Hadoop in Practice, Manning Shelter Island, 2012.

Reference Books

1. Chuck Lam, Hadoop in Action. Manning Shelter Island, 2011.
2. Jimmy Lin and Chris Dyer, Data-Intensive Text Processing with MapReduce, 2010

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective – VI

18CST426 C# AND .NET PROGRAMMING

Course Prerequisite: 18CSE102

L	T	P	C
3	0	0	3

Course Description:
This course uses Microsoft Visual Studio .NET to become familiar with advanced C#.NET programming concepts including database and web programming.

Course Objectives:
1. To cover all segments of programming in C# starting from the language basis, followed by the object oriented programming concepts
2. To update and enhance skills in writing Windows applications, ADO.NET and ASP .NET
3. To introduce data connectivity, WPF, WCF and WPF with C# and .NET 4.5
4. To implement mobile applications using .Net Compact Framework

UNIT I C# LANGUAGE BASICS
Net Architecture - Core C# - Variables - Data Types - Flow control - Objects and Types- Classes and Structs - Inheritance- Generics – Arrays and Tuples - Operators and Casts – Indexers. **(9)**

UNIT II C# ADVANCED FEATURES
Delegates - Lambdas - Lambda Expressions - Events - Event Publisher - Event Listener - Strings and Regular Expressions - Generics - Collections - Memory Management and Pointers - Errors and Exceptions – Reflection. **(9)**

UNIT III BASE CLASS LIBRARIES AND DATA MANIPULATION
Diagnostics -Tasks, Threads and Synchronization - .Net Security - Localization - Manipulating XML- SAX and DOM - Manipulating files and the Registry- Transactions - ADO.NET- Peer-to-Peer Networking - PNRP - Building P2P Applications - Windows Presentation Foundation (WPF). **(9)**

UNIT IV WINDOW BASED APPLICATIONS, WCF AND WWF
Window based applications - Core ASP.NET- ASP.NET Web forms -Windows Communication Foundation (WCF)- Introduction to Web Services - .Net Remoting - Windows Service - Windows Workflow Foundation (WWF) - Activities – Workflows. **(9)**

UNIT V .NET FRAMEWORK AND COMPACT FRAMEWORK
Assemblies - Shared assemblies - Custom Hosting with CLR Objects - Appdomains - Core XAML - Bubbling and Tunneling Events- Reading and Writing XAML - .Net Compact Framework - Compact Edition Data Stores – Errors, Testing and Debugging – Optimizing performance – Packaging and Deployment – Networking and Mobile Devices. **(9)**

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Write various applications using C# Language in the .NET Framework.
2. Develop distributed application using .NET Framework.
3. Enhance skills in writing Windows applications, ADO.NET and ASP .NET.
4. Understand advanced topics namely data connectivity, WPF, WCF and WPF with C# and .NET 4.5.
5. Create Mobile Application using .NET compact Framework.

Textbooks:

1. Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner. ―Professional C# 2012 and .NET 4.5‖, Wiley, 2012.

References:

1. Andrew Troelsen, Pro C# 5.0 and the .NET 4.5 Framework, Apress publication, 2012.
2. Ian Gariffiths, Mathew Adams, Jesse Liberty, ―Programming C# 4.0‖, O‘Reilly, Fourth Edition, 2010.
3. Andy Wigley, Daniel Moth, Peter Foot, ―Mobile Development Handbook‖, Microsoft Press, 2011.
4. Harsh Bhasin, ―Programming in C#‖, Oxford University Press, 2014.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective – VI

18CST427 WIRELESS AND SENSOR NETWORKS

L	T	P	C
3	0	0	3

Pre-requisite **18CST410**

Course Description:
The course provides a comprehensive understanding of the fundamental technologies that help in the networking of wireless devices. The course is intended to understand about sensor networks and the challenges involved in managing a sensor network. It will also cover the protocols at various layers and its differences with traditional protocols and helps to evaluate the performance of sensor networks.

Course Objectives:

1. To learn the fundamental technologies that help in the networking of wireless devices.
2. To learn about different wireless technologies.
3. To understand about sensor networks and the challenges involved in managing a sensor network.
4. To study the various protocols at various layers and its differences with traditional protocols.
5. To evaluate the performance of sensor networks and identify bottlenecks.

UNIT I WIRELESS NETWORKS I

Performance of a Bluetooth- Piconet in the Presence of IEEE 802.11WLANs-UltraWideband Standard and Applications – Radio-Frequency Identification – System – Applications – Wireless Metropolitan Area Networks. **(9)**

UNIT II WIRELESS NETWORKS II

Wireless Broadband: IEEE 802.16 – WiMAX – PHY – MAC – Spectrum Allocation – Satellite – Communication – Systems – Self-Organized Networks – ZigBee. **(9)**

UNIT III VERVIEW OF WIRELESS SENSOR NETWORKS

Characteristics of Wireless Sensor Networks -Challenges for WSN - mobile ad-hoc vs sensor networks –Sensor node Architecture - Physical layer and transceiver design considerations in WSNs **(9)**

UNIT IV ROUTING FOR WSN

Routing Challenges and Design Issues in Wireless Sensor Networks-Gossiping and agent based unicast forwarding-Energy-efficient unicast-Broadcast and multicast-geographic routing- mobile nodes-Data centric and content-based networking-Data aggregation. **(9)**

UNIT V LOCALIZATION

Introduction-Elements of Localization-Sensor Localization with multidimensional scaling Localization in wireless sensor networks. On the security of WSN Localization-Time synchronization in wireless sensor network. **(9)**

Course Outcomes:

At the end of the course students will be assessed to determine whether they are able to

1. Understand the technologies related to Wireless PAN and Wireless LANs.
2. Summarize key Technologies of Wireless Broadband
3. Interpret features and challenges for WSN.
4. Analyze problems and design issues of various Routing protocols in WSN.
5. Apply the localization mechanisms in WSN.

Text Book(s)

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks-Technology, Protocols and Applications”, John Wiley Publication, 2015.
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks - An Information Processing Approach”, Elsevier, 2007.

Reference Books

1. Robert Faludi, “Building Wireless Sensor Networks", O‘Reilly Media, 2011
2. Sitharama Iyengar S, Nandan Parmeshwaran, Balkrishnan N and Chuka D, “Fundaments of Sensor Network Programming, Applications and Technology”, John Wiley & Sons, 2011.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective – VI

18CST428 MODERN APPROACH TO CYBER SECURITY

L	T	P	C
3	0	0	3

Pre-requisite 18CST415

Course Description:
The objective of the Cyber Security course is to systematically introduce the theories, principles and techniques of information systems security. The course covers concepts such as fundamentals of computer security, software security, and network security. After completion of the course, students should be able to identify and analyze security problems in information systems, explain how security mechanisms work in computer systems, use cryptographic algorithms and protocols to achieve computer system security, design and implement security mechanisms to protect information systems.

Course Objectives:

1. To learn the concepts of number theory, cryptographic techniques.
2. To understand integrity and authentication process.
3. To familiarize various cyber threats, attacks, vulnerabilities, defensive mechanisms, security policies and practices.

UNIT I INTRODUCTION TO NUMBER THEORY
Finite Fields and Number Theory: Modular arithmetic, Euclidian Algorithm, Primality Testing: Fermats and Eulers theorem, Chinese Reminder theorem, Discrete Logarithms. **(9)**

UNIT II ADVANCED CRYPTOGRAPHIC TECHNIQUES
Symmetric key cryptographic techniques: Introduction to Stream cipher, Block cipher: DES, AES,IDEA Asymmetric key cryptographic techniques: principles, RSA, ElGamal, Elliptic Curve cryptography, Key distribution and Key exchange protocols. Hash functions, Secure Hash Algorithm (SHA)Message Authentication, Message Authentication Code (MAC), Digital Signature Algorithm : RSA **(9)**

UNIT III CYBERCRIMES AND CYBER OFFENSES
Classification of cybercrimes, planning of attacks, social engineering: Human based, Computer based: Cyberstalking, Cybercafe and Cybercrimes. **(9)**

UNIT IV CYBER THREATS, ATTACKS AND PREVENTION
Phishing, Password cracking, Keyloggers and Spywares, DoS and DDoS attacks, SQL Injection Identity Theft (ID) : Types of identity theft, Techniques of ID theft. **(9)**

UNIT V CYBERSECURITY POLICIES AND PRACTICE
What security policies are: determining the policy needs, writing security policies, Internet and email security policies, Compliance and Enforcement of policies, Review, recent trends. **(9)**

Course Outcomes:

At the end of the course students will be assessed to determine whether they are able to

1. Understand the theoretical basis of number theory in cryptography systems.
2. Demonstrate Symmetric, asymmetric cryptographic techniques and hashing algorithms.
3. Examine the cyber offences in cryptography systems.
4. Illustrate the types of attacks to prevent security breaches.
5. Interpret security policies incorporating in current compliance standards.

Text Book(s)

1. Cryptography and Network security, William Stallings, Pearson Education, 7th Edition,2016.
2. Cyber Security, Understanding cyber crimes, computer forensics and legal perspectives, Nina Godbole,Sunit Belapure, Wiley Publications, Reprint 2016.

Reference Books

1. Cryptography and Network security, Behrouz A. Forouzan , Debdeep Mukhopadhyay, Mcgraw Hill Education, 2 nd Edition, 2011
2. Cybersecurity for Dummies, Brian Underdahl, Wiley, 2011.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Discipline Elective – VI

18CST429 MASTERING VIRTUALIZATION

L	T	P	C
3	0	0	3

Pre-requisite **18CST113**

Course Description:
The objective of this course is to identify and select suitable hypervisor for a cloud environment. The course covers acquires the fundamentals of various virtualization techniques and tools and apply suitable automation and security methods on data centre computer security, software security, and network security.

Course Objectives:

1. To identify and select suitable hypervisor for a cloud environment.
2. To acquire the knowledge of various virtualization techniques and tools.
3. To understand the process of data center automation and secure virtualized environment.

UNIT I INTRODUCTION
Virtualization definition – virtual machine basics – benefits – need for virtualization – limitations − traditional vs. contemporary virtualization process – virtual machines – taxonomy – challenges. Introduction to Hypervisors – Type 1 Hypervisors – Type 2 Hypervisors – comparing hypervisors – virtualization considerations for cloud providers. **(9)**

UNIT II HARDWARE VIRTUALIZATION
Full virtualization - para virtualization - server virtualization - OS level virtualization - emulation – binary translation techniques – managing storage for virtual machines. **(9)**

UNIT III TYPES OF VIRTUALIZATION
Application virtualization - desktop virtualization - network virtualization - storage virtualization - comparing virtualization approaches. **(9)**

UNIT IV VIRTUALIZATION MANAGEMENT
Management life cycle - managing heterogeneous virtualization environment – customized and modifying virtual machines – virtual machine monitoring – management tools. **(9)**

UNIT V AUTOMATION AND SECURITY
Benefits of data center automation – virtualization for autonomic service provisioning – software defined data center - backup - disaster recovery. Mapping Design (Models) to Code – Testing - Usability – Deployment – Configuration Management – Maintenance recent trends. **(9)**

Course Outcomes:

At the end of the course students will be assessed to determine whether they are able to

1. Discuss the fundamentals of virtualization and its limitations.
2. Identify the hardware virtualization techniques.
3. Compare the diverse types of virtualization approaches.
4. Analyze heterogeneous environments in virtualization management tools.
5. Apply automation and security in the software-defined data center.

Text Book(s)

1. Nelson Ruest, Danielle Ruest, Virtualization, A beginners guide, 2009, MGH
2. Nadeau,Tim Cerng, Je Buller, Chuck Enstall, Richard Ruiz, Mastering Microsoft Virtualization, Wiley Publication, 2010.

Reference Books

1. Matthew Portney, Virtualization Essentials, John Wiley & Sons, 2012.
2. Dave Shackleford, Virtualization security, protecting virtualized environment, John Wiley, 2012.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

MANDATORY NON-CREDIT COURSES

Dept. of Computer Science & Technology

Mandatory Course

18CHE901 ENVIRONMENTAL SCIENCES

L	T	P	C
2	0	0	0

Course Prerequisites: Basic knowledge about sciencesup to intermediate or equivalent level.

Course Description: The course deals with basic concepts of environment, its impact on human, universe, consumption of energy sources, effects, controlling methods for pollution and the environmental ethics to be followed by human beings.

Course Objectives:

1. To make the students aware about the environment and its inter-disciplinary nature and to emphasize the importance of the renewable energy sources.
2. To familiarize the concept of Ecosystem and their importance.
3. To bring the awareness among students about the importance of biodiversity and the need for its conservation.
4. To make the students understand the adverse effects of environmental pollution, its causes and measures to control it.
5. To introduce the environmental ethics and emphasize the urgency of rain water harvesting along with water shed management.

UNIT I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, Scope and Importance – Need for Public Awareness. Renewable energy Resources: Solar energy - solar cells, wind energy, tidal energy. Non-renewable energy resources: LPG, water gas, producer gas. Overgrazing, effects of modern agriculture – fertilizer and pesticides. **(6)**

UNIT II: ECOSYSTEMS

Concept of an ecosystem. Structure – functions – Producers, Consumers and Decomposers – Ecological succession – Food chains, Food webs and Ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystems: Forest, Desert and Lake. **(6)**

UNIT III: BIODIVERSITY AND ITS CONSERVATION

Introduction, Definition: Value of biodiversity: consumptive use, productive use, social, ethical and aesthetic values. Biogeographical zones of India. Threats to biodiversity: habitat loss, poaching of wildlife, Endangered and Endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. **(6)**

UNIT IV: ENVIRONMENTAL POLLUTION

Definition, Cause, effects and control measures of pollution – Air, Water, Soil and Noise. Solid Waste Management: Effects and control measures of urban and industrial wastes. **(6)**

UNIT V: SOCIAL ISSUES AND THE ENVIRONMENT

Urban problems related to Water conservation, rain water harvesting and watershed management; Climate changes: global warming, acid rain, ozone layer depletion, nuclear accidents. Case Studies: Population growth, variation among nations and population explosion. **(6)**

Course Outcomes:

At the end of the course, the students will be able to acquire

1. Ability to understand the natural environment, its relationship with human activities and need of the day to realize the importance of the renewable energy sources.
2. The knowledge of various ecosystems and their importance along with the concepts of food chains, food webs and ecological pyramids.
3. Familiarity with biodiversity, its importance and the measures for the conservation of biodiversity.
4. The knowledge about the causes, effects and controlling methods for environmental pollution, along with disaster management and solid waste management.
5. Awareness about the sustainable development, environmental ethics, social issues arising due to the environmental disorders.

TEXT BOOKS:

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press, 2005.
2. Environmental Studies by R. J. Ranjith Daniels and Jagdish Krishnaswamy, (Wiley Re-print version 2014).
3. Chemistry for Environmental Engineering/C.N. Sawyer, P.L. McCarty, G.F. Parkin (TataMcGraw Hill, Fifth Edition, 2003).
4. Environmental Chemistry by B.K. Sharma, (Goel Publishing House, 2014).
5. Environmental Studies by Benny Joseph (TataMcGraw Hill, Second Edition, 2009).

REFERENCE BOOKS:

1. Environmental Science & Engineering by Dr. A. Ravikrishnan, Hitech Publishing Company Pvt. Ltd. 2013.
2. Perspectives in Environmental Studies, Second edition, Anubha Koushik and C.P. Koushik, New Age International (P) Limited, Publishers, 2004.

Mode of evaluation: Assignments, Internal Mid examinations.

Mandatory Course

18HUM902 INDIAN CONSTITUTION

L	T	P	C
2	0	0	0

Course Prerequisites: NIL

Course Objective:

The course is intended to:

1. To know about Indian constitution;
2. To know about central and state government functionalities in India; and
3. To know about Indian society.

UNIT I: INTRODUCTION

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens. **(6)**

UNIT II: STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review. **(6)**

UNIT III: STRUCTURE AND FUNCTION OF STATE GOVERNMENT

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature –Judicial System in States – High Courts and other Subordinate Courts. **(6)**

UNIT IV CONSTITUTION FUNCTIONS

Indian Federal System – Center – State Relations – President's Rule – Constitutional Amendments –Constitutional Functionaries - Assessment of working of the Parliamentary System in India. **(6)**

UNIT V INDIAN SOCIETY

Society: Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections. **(6)**

Course Outcomes:

Upon completion of the course, students will be able to:

1. Understand the functions of the Indian government; and
2. Understand and abide the rules of the Indian constitution.

TEXT BOOKS:

1. Durga Das Basu, “Introduction to the Constitution of India “, Prentice Hall of India, New Delhi.
2. R.C.Agarwal, (1997) “Indian Political System”, S.Chand and Company, New Delhi.
3. Maciver and Page, “ Society: An Introduction Analysis “, Mac Milan India Ltd., New Delhi.
4. K.L.Sharma, (1997) “Social Stratification in India: Issues and Themes”, Jawaharlal Nehru University, New Delhi.

REFERENCE BOOKS:

1. **S**harma, Brij Kishore, “ Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
2. U.R.Gahai, “Indian Political System “, New Academic Publishing House, Jalaendhar.
3. R.N. Sharma, “Indian Social Problems “, Media Promoters and Publishers Pvt. Ltd.

Mode of Evaluation: Assignments, Internal Mid Examinations.

Mandatory Course

18HUM903 ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

L	T	P	C
2	0	0	0

Course Prerequisite:
Basic understanding on Indian culture, traditions, and beliefs. Logistic approach towards learning.

Course Description:
This course deals with introducing and elaborating the importance and capabilities of the ancient, Indian Traditional Knowledge System in achieving heights of success and well-being towards humanity.

Course Objectives:
1. To get exposed to the basics of ITKS;
2. To understand the types and techniques used in Traditional Indian Medicine;
3. To introduce and elaborate the kind of art, architecture along with Vaastu Shashtra knowledge systems. To elucidate the product and construction technologies;
4. To familiarize the basic knowledge in ancient and traditional Astronomy and astrology along with aviation technologies in traditional knowledge systems; and
5. To acquire the knowledge on ancient contemporary world and IT revolution.

UNIT I:
Indian Traditional Knowledge Systems (TKS) – Indian monuments; British Impact; Basics sciences - Philosophy and physical science; Indian physics; story of Kanada; Indian Chemistry; Indian Mathematics. **(6)**

UNIT II:
(Traditional Medicine) Ayurveda – origin, texts, the three greater classics, three lesser classics, concepts; manifestation of creation; mental constitution; three Doshas; individual constitution, clinical process and proceedings; sushruta Samhita and its contents; shastrakarma; Yoga; and siddha. **(6)**

UNIT III:
Production and construction Technology; Art, Architecture and VastuShashtra; crafts and trade – Impact of Technology on society. **(6)**

UNIT IV:
Astronomy and Astrology; Aviation technology in Ancient India - Vedic Astronomy; Eclipses, calculations using earths circumferences; Heliocentric theory of Gravitaton; vedic Astrology; Vaimanika Sastra and its ancient notes. **(6)**

UNIT V:
Information Technology in India – trends – Contemporary issues of IT Industry – Impact of IT on Indian society. **(6)**

Course Outcomes:

At the end of the course, the students will be able to:

1. Understand the basics of Indian Traditional Knowledge System and the origin of basic science and Mathematics,
2. Get familiarized with various traditional medical methods and their implications in the human betterment,
3. Understand various production and construction technologies along with art and architectural implications in TKS,
4. Get the knowledge Vedic astronomy and astrology and get to know the ancient aviation technologies, and
5. Understand the outreach of the TKS to the contemporary world and gain the Indian action in protecting the TKS along with IT revolution.

TEXT BOOKS:

1. Traditional Knowledge System in India, Amit Jha, Atlantic publishers, 2009. ISBN: 978-81-269-1223-0.
2. Traditional Knowledge System & Technology In India, Basanta Kumar Mohantra, Pratibha Prakashan (2012), ISBN-10: 8177023101

REFERENCE BOOKS:

1. Online Materials

Mode of Evaluation: Assignments, Internal Mid Examinations.

Mandatory Course

18CE904 DISASTER MANAGEMENT

Course Prerequisite: None

L	T	P	C
2	0	0	0

Course Description:
The goal of this course is to expose the under graduate students regarding different types of disasters and preparedness needed to mitigate their effects. The course matrix will cover various natural, biological, chemical and emerging hazards and risks that may cause property, loss of lives, and livestock's. Thus, the future engineers will understand the social responsibility for the preparedness and mitigation of the damages caused by the disasters.

Course Objectives:

1. To make aware the students about disasters and their impact on living beings.
2. To ensure the students for the understanding on vulnerability, disasters, disaster prevention and risk reduction.
3. To gain a preliminary understanding of approaches for the Disaster Risk Reduction (DRR)
4. To enhance awareness of institutional processes available in the country for the disaster risk mitigation.
5. To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I: INTRODUCTION
Introduction, Etymology of disaster, Concepts and definitions: disaster, hazard, vulnerability, risks, Resilience, prevention and mitigation. **(6)**

UNIT II: TYPES OF DISASTERS
Types of Disaster; natural disasters (earthquakes, volcanoes, forest fires and explosions, heat and cold waves, floods, draught, cyclones, tsunami, landslides, soil erosion); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.), hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility. **(6)**

UNIT III: DISASTER IMPACTS
Disaster Impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters. **(6)**

UNIT IV: DISASTER RISK MITIGATION MEASURES
Disaster Risk Reduction (DRR) - Disaster management- four phase approach; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications), DRR programmers in India and the activities of National Disaster Management Authority. Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction.

(6)

UNIT V: IMPACT OF DEVELOPMENTAL ACTIVITIES

Disasters, Environment and Development - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, landuse changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods. **(6)**

Course Outcomes:

The student will develop competencies in:

1. Understanding on the nature of disasters
2. Application of Disaster Concepts to Management
3. Analyzing Relationship between Development and Disasters.
4. Ability to understand Categories of Disasters
5. Realization of the responsibilities to society

TEXTBOOK:

1. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

REFERENCE BOOKS:

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority)
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
4. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
5. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
6. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

Mode of Evaluation: Assignments, Internal Mid Examinations.

HONORS

Honors in Computer Science & Technology

B. Tech III Year I Semester

18HDCST101 MULTIDISCIPLINARY RESEARCH METHODS FOR THE STUDY OF EVOLUTION

L	T	P	C
3	0	0	3

Course Prerequisite: NIL

Course Description:
This course deals with basics of research and explores multifaceted possibilities in the discipline of research and provide participants the opportunity to practically, theoretically, critically and creatively think through methodological issues in their research and the research of others.

Course Objectives:
1. To explore multifaceted possibilities and pathways of translation and dialogue across knowledge, discipline, community and social borders
2. To further multifaceted possibilities and pathways of translation and dialogue across knowledge, discipline, community and social borders.
3. To provide participants the opportunity to practically, theoretically, critically and creatively think through methodological issues in their research and the research of others.
4. To engage in participatory interdisciplinary learning and exchange.

UNIT I: INTRODUCTION TO RESEACH METHODOLOGIES
Survey of Research Methodologies- Rationalism, Idealism, Positivism, Post Positivism, Introduction to major binaries, Subjectivity vs Objectivity, Realism vs Anti –realism, True vs False, Scientific evolution vs Scientific Revolutions, Continuity vs Discontinuity, Deterministic vs Probabilistic, Linearity vs Non –Linearity, Beyond the binaries **(9)**

UNIT II: TYPES OF RESEARCH METHODS
T Methods: Epistemology, Ontology, Deduction, Induction, Hypothetical Deductive method, Explanation and Prediction, General and Particular, Cause and Effect. **(8)**

UNIT III: QUANTITATIVE TECHNIQUES
Techniques-Quantitative Techniques, Techniques of generating data, Techniques of classification, Techniques of measures, Central Tendency and Dispersion, Measures of Correspondence/Correlation, Measures of Causal relations/Regression, Techniques of Explanation ANOVA, Time Series Analysis- ARMA Adaptive Estimation Procedures (Kalman Filters) Techniques of inference. **(8)**

UNIT IV: STATISTICAL METHODS
Advanced Techniques- Advanced Statistical Methods for data Analysis, Structural, quantitative, statistical approaches for the analysis of data **(8)**

UNIT V: CLASSIFICATION AND APPLICATION

Advances in classification, clustering and pattern recognition methods, Strategies for modelling complex data and mining large data sets, Chaos analysis and its measurement, Methods for the extraction of knowledge from whatever type of data, and Application of advanced methods in specific domains of practice. **(12)**

Course Outcomes:

Upon successful completion of the course, students will be able to

6. Discuss the various research component and binaries.
7. Understand the guidelines for research methods.
8. Understand the various types of quantitative techniques and statistical methods.
9. Apply the various classification technique in advanced applications

Text Books:

1. Abraham Kaplan, 1964, Conduct of Inquiry, Chander Publishing Company, California.
2. Ann Majchrzak, 1984, Methods for Policy Research, Sage London
3. Thomas S Khun, 1970, The Structure of Scientific Revolution, University of Chicago Press, Chicago

Reference Books:

1. Carl G Hempel "The Covering Law Analysis of Scientific Explanation" in Leonard I Krimerman (ed)
2. Catheriner Marsh, 1988, Exploring Data, Polity Press, Cambridge
3. Cohen and Ernest Nagel (ed) 1978, An Introduction to Logic and Scientific Method, Allied,
4. New Delhi

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Honors in Computer Science & Technology

B. Tech III Year I Semester

18HDCST102 NATURAL LANGUAGE PROCESSING

L	T	P	C
3	0	0	3

Course Prerequisite: Nil

Course Description:

This course covers the basics of text processing including basic pre-processing, spelling correction, language modeling, Part-of Speech tagging, Constituency and Dependency Parsing, Lexical Semantics, distributional Semantics and topic models.

Course Objectives:

1. To learn the fundamentals of natural language processing
2. To appreciate the use of CFG and PCFG in NLP
3. To understand the role of semantics and pragmatics

Course Outcomes:
Upon completion of the course, the students will be able to:

1. To tag a given text with basic Language features
2. To design an innovative application using NLP components
3. To implement a rule based system to tackle morphology/syntax of a language
4. To design a tag set to be used for statistical processing for real-time applications
5. To compare and contrast use of different statistical approaches for different types of NLP applications.

UNIT I INTRODUCTION
Words - Regular Expressions and Automata - Words and Transducers - N-grams - Part-of-Speech – Tagging - Hidden Markov and Maximum Entropy Models. **(9)**

UNIT II SPEECH
Speech – Phonetics - Speech Synthesis - Automatic Speech Recognition - Speech Recognition: - Advanced Topics - Computational Phonology **(9)**

UNIT III SYNTAX
Formal Grammars of English - Syntactic Parsing - Statistical Parsing - Features and Unification - Language and Complexity. **(9)**

UNIT IV SEMANTICS AND PRAGMATICS
The Representation of Meaning - Computational Semantics - Lexical Semantics - Computational Lexical Semantics - Computational Discourse **(9)**

UNIT V APPLICATIONS

Information Extraction - Question Answering and Summarization - Dialogue and Conversational Agents - Machine Translation **(9)**

TEXT BOOKS:

1. Daniel Jurafsky, ―Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech‖, Pearson Publication, 2014.

2. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python‖, First Edition, O‘Reilly Media, 2009.

REFERENCES:

1. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook‖, Atlantic Publisher, 2015.

2. Richard M Reese, ―Natural Language Processing with Java‖, O‘Reilly Media, 2015.

3. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing‖, Second Edition, Chapman and Hall/CRC Press, 2010.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Honors in Computer Science & Technology

B. Tech III Year I Semester

18HDCST103 GAME DESIGN AND DEVELOPMENT

L	T	P	C
3	0	0	3

Course Prerequisite: Nil

Course Description:

This course covers the basics of text processing including basic pre-processing, spelling correction, language modeling, Part-of Speech tagging, Constituency and Dependency Parsing, Lexical Semantics, distributional Semantics and topic models.

Course Objectives:

1. To learn the fundamentals of natural language processing
2. To appreciate the use of CFG and PCFG in NLP
3. To understand the role of semantics and pragmatics

Course Outcomes:
Upon completion of the course, the students will be able to:
1. To tag a given text with basic Language features
2. To design an innovative application using NLP components
3. To implement a rule based system to tackle morphology/syntax of a language
4. To design a tag set to be used for statistical processing for real-time applications
5. To compare and contrast use of different statistical approaches for different types of NLP applications.

UNIT I INTRODUCTION
Words - Regular Expressions and Automata - Words and Transducers - N-grams - Part-of-Speech – Tagging - Hidden Markov and Maximum Entropy Models. **(9)**

UNIT II SPEECH
Speech – Phonetics - Speech Synthesis - Automatic Speech Recognition - Speech Recognition: - Advanced Topics - Computational Phonology **(9)**

UNIT III SYNTAX
Formal Grammars of English - Syntactic Parsing - Statistical Parsing - Features and Unification - Language and Complexity. **(9)**

UNIT IV SEMANTICS AND PRAGMATICS
The Representation of Meaning - Computational Semantics - Lexical Semantics - Computational Lexical Semantics - Computational Discourse **(9)**

UNIT V APPLICATIONS
Information Extraction - Question Answering and Summarization - Dialogue and Conversational Agents - Machine Translation **(9)**

TEXT BOOKS:

1. Daniel Jurafsky, ―Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech‖, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python‖, First Edition, O‗Reilly Media, 2009.

REFERENCES:

1. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook‖, Atlantic Publisher, 2015.
2. Richard M Reese, ―Natural Language Processing with Java‖, O‗Reilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing‖, Second Edition, Chapman and Hall/CRC Press, 2010.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Honors in Computer Science & Technology

B. Tech III Year II Semester

18HDCST104 HIGH PERFORMANCE COMPUTING

L	T	P	C
3	0	0	3

Course Prerequisite: 18CST108

Course Description:
The course aims to give an introductory overview of High Performance Computing (HPC) in general, and of the facilities of the High Performance Computing Service (HPCS) in particular. Practical examples of using the HPCS clusters will be used throughout, although it is hoped that much of the content will have applicability to systems elsewhere..

Course Objectives:
1. Provide systematic and comprehensive treatment of the hardware and the software high performance techniques invovled in current day computing.
2. Introduce the fundamentals of high-performance computing with the graphics processing units and many integrated cores using their architectures and corresponding programming environments.
3. Introduce the learner to fundamental and advanced parallel algorithms through the GPU and MIC programming environments
4. Provide systematic and comprehensive treatment of the components in the pipeline that extract instruction level parallelism.
5. Provide a strong foundation on memory hierarchy design and tradeoffs in both uniprocessor and multiprocessors.
6. Illustrate the cache coherence and consistency problems in multiprocessors, and their existing solutions.

UNIT -I: GRAPHICS PROCESSING UNITS
Introduction to Heterogeneous Parallel Computing. GPU architecture. Thread hierarchy. GPU Memory Hierarchy. **(9)**

UNIT -II: GPGPU PROGRAMMING
Vector Addition, Matrix Multiplication algorithms. 1D, 2D, and 3D Stencil Operations. Image Processing algorithms – Image Blur, Grayscaling. Histogramming, Convolution, Scan, Reduction techniques **(9)**

UNIT- III MANY INTEGRATED CORES
Introduction to Many Integrated Cores. MIC, Xeon Phi architecture. Thread hierarchy. Memory Hierarchy. Memory Bandwidth and performance considerations **(9)**

UNIT – IV XEON PHI PROGRAMMING

Vector Addition, Matrix Multiplication algorithms. 1D, 2D, and 3D Stencil Operations. Image Processing algorithms – Image Blur, Grayscaling. Histogramming, Convolution, Scan, Reduction techniques **(9)**

UNIT V: SHARED MEMORY PARALLEL PROGRAMMING & MESSAGE PASSING INTERFACE

Symmetric and Distributed architectures. OpenMP Introduction. Thread creation, Parallel regions. Worksharing, Synchronization. MPI Introduction. Collective communication. Data grouping for communication. **(9)**

Course Outcomes:

Upon successful completion of the course, students will be able to

1. The learner will be able to design, formulate, solve and implement high performance versions of standard single threaded algorithms
2. The learner will know and will be able to demonstrate the architectural features in the GPU and MIC hardware accelarators.
3. The learner will be able to design programs to extract maximum performance in a multicore, shared memory execution environment processor.
4. The learner will be able to design and deploy large scale parallel programs on tightly coupled parallel systems using the message passing paradigm.
5. .

Text Books:

3. . Wen-Mei W Hwu, David B Kirk, Programming Massively Parallel Processors A Hands-on Approach, Morgann Kaufmann, 3e.

Reference Books:

1. Rezaur Rahman, Intel Xeon Phi Coprocessor Architecture and Tools, Apress Open, 2013.
2. Barbara Chapman, Gabriele Jost, Ruud van der Pas, Using OpenMP, MIT Press, 2008.
3. Gropp, Lusk, Skjellum, Using MPI, Using MPI, 2014.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Honors in Computer Science & Technology

B. Tech III Year II Semester

18HDCST105 ADVANCED COMPUTER NETWORKS AND COMMUNICATIONS

L	T	P	C
3	0	0	3

Course Prerequisite: 18CST108

Course Description:
In the last decades, the widespread use of the Internet as a general-purpose network and the continuous growth in communications, has motivated an increasing demand for new competencies and skills in the networking area. This demand involves multiple players, including academia, research and development centers, service providers and industry, illustrating a clear trend toward services integration in a single communication platform, where the Internet Protocol is seen as the convergence technology layer. In this scenario, strong efforts have been made to adapt and improve TCP/IP networks with enhanced service models, protocols, control and management facilities, in order to accommodate the integration of applications and services with distinct quality requirements. Achieving seamless and ubiquitous networking solutions is a further intricate issue attending to the plethora of service providers with their own business, management and technological strategies. Despite ongoing advances, achieving scalable and flexible networking solutions requires further study and contributions at multiple levels. In this context, the course unit on "Advanced Computer Networks" aims to provide advanced background on relevant computer networking topics, allowing postgraduate students to acquire and pursue deeper knowledge in the field.

Course Objectives:

1. To study the problematic of service integration in TCP/IP networks focusing on protocol design, implementation and performance issues.
2. To debate the current trends and leading research in the computer networking area.

UNIT -I: INTRODUCTION AND IPV6
Introduction: Course organization and objectives, Next generation networking: Motivation and Challenges. IPv6 Internetworking and Mobility, Internetworking with IPv6; IPv6 extensions and functionality. Routing advances. Mobile IP networking. Micro and macro mobility. **(9)**

UNIT -II: IP CONVERGENCE AND QOS
Service integration and Quality of Service (QoS) in IP networks. Service contracts. Services specification, configuration and management. Service-oriented architectures (SOA) - services in SOA-based networks; technologies for the support and development of services, technologies and APIs for SOA; WebServices and associated technologies. **(9)**

UNIT- III ADVANCED TRANSPORT ISSUES AND SIGNALLING

Reliable and unreliable transport services for the support of QoS and real-time. Signalling for Multiconstrained Services and Applications. Case studies: Video over IP and VoIP. **(9)**

UNIT – IV MANAGING TCP/IP NETWORKS

Management models and functions. Autonomic management. Internet measurement and monitoring. **(9)**

UNIT V: SELF-ORGANIZING NETWORKS

Ad-hoc, sensors and mesh networks; applications; communication support: information dissemination, medium access mechanisms, routing mechanisms, transport protocols, quality of service and security; self-organizing concepts in infrastructure networks. **(9)**

Course Outcomes:-

1. To identify and discuss the concepts underlying IPv6 protocol, and their main characteristics and functionality;
2. To understand the principles and functionality of mobile IP, explaining its concretization in IPv6; to understand the needs of optimization of the mobility mechanisms and description of some extensions that aim to reduce handover latency and requirements from terminals;
3. To recognize the need for service integration and discuss how it can be accomplished;
4. To explain and exemplify current QoS architectures and mechanisms, and the QoS support challenges in future networks;
5. To understand and explain the design issues in transport services in face of applications and services requirements;
6. To understand theoretical and practical concepts behind the design of multi-constrained applications and services;
7. To discuss relevant management issues and devise adequate network management solutions;
8. To identify and assess possible research opportunities and difficulties within the course scope.

Text Book:

1. Silvia Hagen, "IPv6 Essentials", OReilly, 2002.
2. Z. Wang, "Internet QoS: Architectures and Mechanisms for Quality of Service", The Morgan Kaufmann Series in Networking, 2001.

References:

1. Michael Welzl, "Network Congestion Control: Managing Internet Traffic", John Wiley & Sons, 2005
2. Colin Perkins, "RTP: Audio and Video for the Internet", Addison-Wesley Professional, 2003

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Honors in Computer Science & Technology

B. Tech III Year II Semester

18HDCST106 GAME DESIGN STUDIO

L	T	P	C
3	0	0	3

Course Prerequisite: NIL

Course Description:
This course deals with basics of game design development, processes, mechanics and issues in Game Design and exposed to the Core architectures of Game Programming.

Course Objectives:

1. Understand the concepts of Game design and development.
2. Learn the processes, mechanics and issues in Game Design.
3. Be exposed to the Core architectures of Game Programming.
4. Know about Game programming platforms, frame works and engines. Learn to develop games.

UNIT I: 3D GRAPHICS FOR GAME PROGRAMMING

3D Transformations, Quaternions, 3D Modeling and Rendering, Ray Tracing, Shader Models, Lighting, Color, Texturing, Camera and Projections, Culling and Clipping, Character Animation, Physics-based Simulation, Scene Graphs. **(9)**

UNIT II: GAME ENGINE DESIGN

Game engine architecture, Engine support systems, Resources and File systems, Game loop and real-time simulation, Human Interface devices, Collision and rigid body dynamics, Game profiling. **(9)**

UNIT III: GAME PROGRAMMING

Application layer, Game logic, Game views, managing memory, controlling the main loop, loading and caching game data, User Interface management, Game event management. **(9)**

UNIT IV: GAMING PLATFORMS AND FRAMEWORKS

2D and 3D Game development using Flash, DirectX, Java, Python, Game engines - Unity. DX Studio. **(9)**

UNIT V: GAME DEVELOPMENT

Developing 2D and 3D interactive games using DirectX or Python – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi-Player games. **(9)**

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand the concepts of Game design and development.
2. Understand the processes, mechanics and issues in Game Design.
3. Understand exposed to the Core architectures of Game Programming.
4. understand about Game programming platforms, frame works and engines and develop games.

Text Books:

1. Mike Mc Shaffrfy and David Graham, “Game Coding Complete”, Fourth Edition, Cengage Learning, PTR, 2012.
2. Jason Gregory, “Game Engine Architecture”, CRC Press / A K Peters, 2009.

Reference Books:

1. Ernest Adams and Andrew Rollings, “Fundamentals of Game Design”, 2 nd Edition Prentice Hall / New Riders, 2009.
2. Eric Lengyel, “Mathematics for 3D Game Programming and Computer Graphics”, 3 rd Edition, Course Technology PTR, 2011.
3. Jesse Schell, The Art of Game Design: A book of lenses, 1 st Edition, CRC Press, 2008.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Honors in Computer Science & Technology

B. Tech IV Year I Semester

18HDCST107 EVOLUTIONARY COMPUTING

Course Prerequisite: NIL

L	T	P	C
3	0	0	3

Course Description:

This course introduces the field of evolutionary computing (EC) and surveys the major types of evolutionary algorithms (EAs), a class of stochastic, population-based algorithms inspired by natural evolution theory, genetics, and population dynamics, capable of solving complex optimization and modeling problems. This is a rigorous and programming intensive course in which students will implement course concepts to gain hands-on experience in solving complex problems with EAs. Some popular types of EAs that will be reviewed are Genetic Algorithms, Evolution Strategies, Genetic Programming, Differential Evolution, Learning Classifier Systems, and Hyper-heuristics. This course will follow a unified approach focusing on the general characteristics of all EA types.

Course Objectives:

1. The ability to analyze and explain EA behavior,
2. The skills necessary to write formal technical reports in the field of EC.

UNIT -I: INTRODUCTION

Complex adaptive systems (cas) as the motivation for genetic-algorithm (GA) research; classifier systems; overview of GA mechanisms and theory; quick run-through of EVOKE, the Evolutionary Computation Engine. Technical details of GA mechanisms; fitness landscapes; GA applications - prisoner's dilemma, sorting networks, task scheduling. **(9)**

UNIT -II: GENETIC PROGRAMMING

Introduction to genetic grogramming (GP), Comparison of GA and GP. GA and GP applications to cellular automata, Advanced implementation details in EC. GP applications to control and classification problems **(9)**

UNIT-III: GENETIC ALGORITHM

Theoretical aspects of GAs: building blocks, schema theory, royal-roads functions. EC applications to neural nets. Introduction to Artificial Life. Modelling Learning and Evolution. Sampling of artificial life systems **(9)**

UNIT – IV: PROBLEM REPRESENTATION

Derivative Methods in Genetic Programming, Learning Classifier Systems, Hybrid Methods. Introduction to Representations, Binary Strings, Real-Valued Vectors. Permutations, Finite-State Representations, Parse Trees **(9)**

UNIT V: GA OPERATORS

Introduction to Selection, Proportional Selection and Sampling Algorithms. Tournament Selection, Rank-based Selection, Boltzmann Selection. Generation Gap Methods, A comparison of Selection Mechanisms. Introduction to Search Operators, Mutation Operators, Recombination. **(9)**

Course Outcomes:-

1. To understanding of core EC concepts and EA mechanisms,
2. Understand of how to identify (real-world) problems for which EC is appropriate,
3. To implement and configure EAs to solve appropriate problems,
4. Tto perform statistical analysis on stochastic algorithms such as EAs, and
5. Skills necessary to write basic technical reports on solving problems with EC.

Text Book:

1. Genetic Programming, an Introduction, Wolfgang Banzhaf, Peter Nordin, Robert E. Keller, and Frank D. Francone, Morgan Kaufmann Publishers, 1998..

References:

1. An Introduction to Genetic Algorithms, Melanie Mitchell, MIT Press, 1996.
2. Genetic Programming, John Koza, MIT Press, 1992.
3. Evolutionary Computation, The Fossil Record, David Fogel, IEEE Press, 1998.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Honors in Computer Science & Technology

B. Tech IV Year I Semester

18HDCST108 ADVANCED SOFTWARE ENGINEERING

Course Prerequisite: NIL

L	T	P	C
3	0	0	3

Course Description

The course aims to develop the broad understanding of the discipline of software engineering (gained in the earlier Software Engineering course) by considering the wider systems engineering context in which software plays a role. It aims to examine the concepts and techniques associated with a number of advanced and industrially relevant topics, relating to both the product and processes of software engineering. It seeks to complement this with an account of the associated practical and professional issues in software engineering.

Course Objectives:

1. To understand Software Engineering Lifecycle Models
2. To do project management and cost estimation
3. To gain knowledge of the System Analysis and Design concepts.
4. To understand software testing approaches
5. To be familiar with DevOps practices

UNIT I: INTRODUCTION

Software engineering concepts –Development activities –Software lifecycle models -Classical waterfall -Iterative waterfall –Prototyping –Evolutionary -Spiral –Software project management – Project planning –Estimation –Scheduling –Risk management –Software configuration management. **(9)**

UNIT II: SOFTWARE REQUIREMENT SPECIFICATION

Requirement analysis and specification –Requirements gathering and analysis –Software Requirement Specification –Formal system specification –Finite State Machines –Petrinets – Object modelling using UML –Use case Model –Class diagrams –Interaction diagrams –Activity diagrams –State chart diagrams –Functional modelling –Data Flow Diagram. **(9)**

UNIT III ARCHITECTURE AND DESIGN

Software design –Design process –Design concepts –Coupling –Cohesion –Functional independence –Design patterns –Model-view-controller –Publish-subscribe –Adapter –Command –Strategy –Observer –Proxy –Facade –Architectural styles –Layered -Client-server -Tiered -Pipe and filter.-User interface design **(9)**

UNIT IV TESTING

Testing –Unit testing –Black box testing–White box testing –Integration and System testing– Regression testing –Debugging -Program analysis –Symbolic execution –Model Checking. **(9)**

UNIT V: DEVOPS

DevOps: Motivation-Cloud as a platform-Operations-Deployment Pipeline: Overall Architecture-Building and Testing-Deployment-Case study: Migrating to Microservices. **(9)**

Course Outcomes:-

1. Understand the advantages of various Software Development Lifecycle Models
2. Gain knowledge on project management approaches as well as cost and schedule estimation strategies
3. Perform formal analysis on specifications
4. Use UML diagrams for analysis and design
5. Architect and design using architectural styles and design patterns
6. Understand software testing approaches
7. Understand the advantages of DevOps practices

Text Book:

1. Bernd Bruegge, Alan H Dutoit, Object-Oriented Software Engineering, 2ndedition, Pearson Education, 2004..
2. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Fundamentals of Software Engineering, 2nd edition, PHI Learning Pvt. Ltd., 2010.

References:

1. Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005.
2. Len Bass, Ingo Weberand Liming Zhu, ―DevOps: A Software Architect‘s Perspective‖, Pearson Education, 2016
3. Rajib Mall, Fundamentals of Software Engineering, 3rdedition, PHI Learning Pvt. Ltd., 2009.
4. Stephen Schach, Software Engineering 7th ed, McGraw-Hill, 2007

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Honors in Computer Science & Technology

B. Tech IV Year I Semester

18HDCST109 EXPERIENTIAL LEARNING IN DATA SCIENCE

L	T	P	C
3	0	0	3

Course Prerequisite: NIL

Course Description:

As an introduction to the emerging interdisciplinary field of data science, this course surveys the main concepts, tools, and techniques used to obtain, explore, and analyze data to extract information, gain insight, and solve problems in applied contexts – with emphasis on practical application using real-world data from many disciplines. Students will learn and practice techniques for acquiring/integrating data, tidying/cleaning data, and wrangling/munging data into useful form. Data analysis techniques include exploratory data analysis, data visualization, descriptive/predictive statistical modeling and inference, and machine learning algorithms.

Course Objectives:

1. Students will develop relevant **programming** abilities.
2. Students will demonstrate proficiency with statistical **analysis of data**.
3. Students will develop the ability to build and assess data-based **models**.
4. Students will execute statistical analyses with professional statistical **software**.
5. Students will demonstrate skill in **data management**.

UNIT I: INTRODUCTION

Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications **(9)**

UNIT II: DATA COLLECTION

Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, using multiple data sources **(9)**

UNIT III: DATA ANALYSIS

Data analysis: Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes. **(9)**

UNIT IV: DATA VISUALISATION

Data visualisation: Introduction, Types of data visualisation, Data for visualisation: Datatypes, Data encodings, Retinal variables, mapping variables to encodings, Visual encodings. **(9)**

UNIT V: APPLICATIONS OF DATA SCIENCE

Applications of Data Science, Technologies for visualisation, Bokeh (Python), recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science. **(9)**

Course Outcomes:-

1. Ability to identify the characteristics of datasets and compare the trivial data and data science for various applications
2. Ability to select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.

Text Book:

1. Cathy O'Neil, Rachel Schutt, Doing Data Science, Straight Talk from The Frontline. O'Reilly, 2013

References:

1. Jure Leskovek, Anand Rajaraman, Jeffrey Ullman, Mining of Massive Datasets. v2.1,CambridgeUniversity Press, 2014.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

MINORS

Dept. of Computer Science & Technology

Minors in Computer Science & Technology

B. Tech III Year I Semester

18MDCST101 DESIGN AND ANALYSIS OF ALGORITHMS

L	T	P	C
3	0	0	3

Course Prerequisite: 18CSE102**,** 18CST102

Course Description:
This course emphasis on analysis of various types of algorithms. It provides idea to design the algorithm to solve the problems using complexity analysis.

Course Objectives:

4. To introduce the concepts of Algorithm Analysis, Time Complexity, Space Complexity.
5. To discuss various Algorithm Design Strategies with proper illustrative examples.
6. To introduce Complexity Theory with NP and Linear programming.

UNIT I: INTRODUCTION & DIVIDE AND CONQUER
Introduction: Algorithm specification, growth of functions, Asymptotic notations. **Divide and Conquer:** Master Method, Binary Search, Finding the maximum and minimum, Merge sort, Quick Sort, Median finding Algorithm, Strassen's matrix multiplication. **(9)**

UNIT II: GREEDY METHOD & DYNAMIC PROGRAMMING
Greedy Method: General method, Knapsack problem, Huffman Code, Job Scheduling with Deadlines, Minimum cost Spanning Trees. **Dynamic Programming:** Fibonacci, LCS, Matrix Chain Multiplication, Stamp Problem, Knapsack problems, The traveling sales person problem. **(9)**

UNIT III: GRAPH ALGORITHMS & ADVANCED GRAPH ALGORITHMS
Graph Algorithms: BFT, DFT, topological sort, Connected components, Minimum cost Spanning Trees, Kruskal's algorithm, Prim's algorithm.
Advanced Graph Algorithms: Shortest Path Algorithm: Single Source Shortest path Algorithm Dijkstra's, All Pairs Shortest Path Algorithm – Floyd Warshall's. **(9)**

UNIT IV: BACK TRACKING, BRANCH AND BOUND
Backtracking: Introduction, n-Queens Problem, sum of subsetproblem
Branch and Bound: The method, Travelling salesperson, 0/1 Knapsack problem. **(9)**

Unit V: NP–HARD AND NP– COMPLETE PROBLEMS
NP–Hard and NP–Complete Problems: Complexity Class - P, NP, NP Complete, NP Hard. Is P=NP, Reducibility. **Network flow problem-**Ford Fulkerson Algorithm for Maximum Flow Problem **(9)**

Course Outcomes:

1. Analyze the complexity of the algorithms and use divide and conquer technique to solve the problems.
2. Identify feasible solutions for different problems through greedy method and dynamic programming.
3. Solve the problems using graph algorithms.
4. Solve problems using Backtracking & Branch and Bound techniques.
5. Apply NP Hard & NP Complete techniques to solve complex problems.

Text Books:

1. Micheal T. Goodrich and Roberto Tamassia: Algorithm Design: Foundations, Analysis and Internet examples (Algorithms, MIT Press, Second Edition)
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran. Fundamentals of Computer Algorithms, MIT Press, Second Edition (Prentice Hall)

References:

1. Cormen T.H., Leiserson, C.E., Rivest, R.L., and C. Stein. Introduction to Algorithms, MIT Press, Second Edition.
2. Jon Kleinberg and Eva Tardos. Algorithm Design. Pearson Education. (2007)
3. Sanjoy Das Gupta, Christos Papadimitriou, Umesh Vazirani, Algorithms Tata McGraw-Hill Publishers
4. Alfred V. Aho, John E. Hopcroft, Jeffery D.Ulman. Data Structures and Algorithms

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

Dept. of Computer Science & Technology

Minors in Computer Science & Technology

B. Tech III Year I Semester

18MDCST102 DATABASE MANAGEMENT SYSTEMS

Course Prerequisite: None

L	T	P	C
3	0	0	3

Course Description:
This course is designed to provide basic understanding on database systems and its design. The course material further used for developing any web based applications in which database is back end. Course covers from all basic and advanced queries of SQL, PL/SQL programs, Relational algebra and calculus, normal forms, low level details such as representing data elements of database and indexed structures, transaction management and data recovery.

Course Objectives:
1. To understand the components of DBMS and to study the database design.
2. To study the retrieval of data using relational algebra and calculus and the concept of normal forms in the design of database.
3. To comprehend the structure of SQL Queries to query, update, and manage a database.
4. To understand all constraints to develop a business application using cursors, triggers and stored procedures.
5. To provide knowledge on distributed databases, concurrency techniques.

UNIT I: DATABASE SYSTEM ARCHITECTURE AND RELATIONAL MODEL
Overview of Database Systems: Managing data, File Systems versus a DBMS,
Introduction to Database Design: Database design and ER Diagrams, Entities, Attributes and Entity sets, Relationships and relationship types, Additional features of ER model, conceptual design with the ER Model. **Introduction to Relational Model**: Introduction, Integrity Constraints, Logical database design, Introduction to views.
Relational Algebra: Preliminaries, Relational algebra- Selection and Projection, Set Operations, Renaming, Joins, Division **(9)**

UNIT II: RELATIONAL CALCULUS AND SQL
Relational Calculus – Expressive power of Algebra and Calculus.
The Database Language SQL – Simple Queries in SQL – Queries Involving More than One Relation, Sub Queries, aggregate operators, null values, complex integrity constraints, triggers and active databases Embedded SQL, Dynamic SQL, Cursors, Introduction to JDBC, Stored Procedures. **(9)**

UNIT III: DATABASE DESIGN
Functional Dependencies– Rules about Functional Dependencies, Keys, Design of Relational Database Schemas, Multivalued Dependencies. **(9)**

UNIT IV: STORAGE STRATEGIES AND TRANSACTION PROCESSING

Storage strategies: Indices, B-trees, hashing. **Transaction Processing:** Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes,. **(9)**

UNIT V: DATABASE SECURITY

Databaserecovery Authentication, Authorization and access control, DAC, MAC and RBAC models, SQL injection. **(9)**

Course Outcomes:

At the end of the course, students will able to

1. Design database structure and represent ER model.
2. Construct relational algebra expressions for the query.
3. Design database and access data from the database using SQL queries.
4. Implement transaction processing techniques in database.
5. Design database security plan for database.

Text Books:

1. Database Management Systems, Raghu RamaKrishnan, Johannes Gehrke, 3rd Edition, 2003, McGraw Hill.
2. Database Systems, The Complete Book, Hector Garcia-Molina, Jeffrey D. Ullman and Jennifer Widom, 3rd impression, 2009, Pearson.

References:

1. "Data base System Concepts", Silberschatz, Korth, McGraw Hill, V edition
2. "Fundamentals of Database Systems", Elmasri Navathe, 6th edition, 2013, Pearson.
3. "Introduction to Database Systems", C. J. Date, Pearson Education.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Minors in Computer Science & Technology

B. Tech III Year II Semester

18MDCST103 BIG DATA ANALYTICS

L	T	P	C
3	0	0	3

Course Prerequisite: Nil

Course Description:

This course introduces fundamental concepts and tools required to understand Data analytics. The also discusses big data applications in Data Science and covers the applications and technologies needed to process the large-scale data.

Course Objectives:

6. To learn data mining and big data basics
7. To learn the big data in technology perspective
8. To learn Hadoop framework for data analytics
9. Applying MapReduce paradigm to solve problems
10. To interpret the potential applications in big data scenario.

UNIT I INTRODUCTION TO DATA MINING AND BIG DATA

Introduction to Data mining, KDD process, Data Mining Techniques: Mining Frequent patterns, Association rule, Cluster analysis, Classification and Regression. Introduction to Big Data - What is Big Data? Explosion in Quantity of Data, Big Data Characteristics, Types of Data, Common Big data Customer Scenarios, BIG DATA vs. HADOOP, A Holistic View of a Big Data System, Limitations of Existing Data Analytics Architecture. **(9)**

UNIT II DATA ANALYTICS LIFE CYCLE

Introduction to Big data Business Analytics - State of the practice in analytics role of data scientists- Key roles for successful analytic project - Main phases of life cycle - Developing core deliverables for stakeholders. **(9)**

UNIT III INTRODUCTION TO HADOOP

Why DFS? What is Hadoop? Hadoop Distribution, Hadoop Key Characteristics, RDBMS vs. Hadoop, Hadoop 2.x Cluster Architecture, Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands, Anatomy of File Write and Read., Name Node, Secondary Name Node, and Data Node, Hadoop 2.0 New Features – Name Node High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN Hadoop Distributed File System. **(9)**

UNIT IV PROGRAMMING FOR DATA ANALYTICS

MapReduce program in Java – Map Reduce API – Programming Examples- Combiner Functions Streams and Files - Streams – Text Input and Output – Reading and Writing Binary Data. **(9)**

UNIT V DATA SCIENCE AND APPLICATIONS

Data Loading Techniques & Data Analysis, Text Analytics for Large unstructured information, Analytic Stack, Big Data Applications - Fraud detection in Stock markets, Sentiment Analysis.

(9)

Course Outcomes:

At the end of the course, students will be able to:

1. Apply data mining algorithms for classification and clustering.
2. Understand Big data framework.
3. To understand the map reduce way of solving analytic problems.
4. Illustrate the problem and its solution.
5. Analyze big data applications.

Text Books:

1. Jiawei Han Micheline Kamber Jian Pei, Data Mining: Concepts and Techniques, Third Edition, Elsevier, Morgan Kaufmann, 2011.
2. Tom White, “Hadoop: The Definitive Guide”, 3rd Edition, O’reilly, 2012.
3. Alberto Cordoba, “Understanding the Predictive Analytics Lifecycle”, Wiley, 2014.
4. Eric Siegel, Thomas H. Davenport, “Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die”, Wiley, 2013.

References:

1. Chuck Lam , Hadoop in Action, Manning, Second Edition ,2016.
2. Mark Gardener, Beginning R: The Statistical Programming Language, Wiley, 2013.
3. Jiawei Han and Micheline Kamber, Data Mining, Second Edition, Elsevier, 2007. ISBN: 81-312-0535-5.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Technology

Minors in Computer Science & Technology

B. Tech III Year II Semester

18MDCST104 DATA SCIENCE

L	T	P	C
3	0	0	3

Course Prerequisite: Nil

Course Description:
Modern scientific, engineering, and business applications are increasingly dependent on data, existing traditional data analysis technologies were not designed for the complexity of the modern world. Data Science has emerged as a new, exciting, and fast-paced discipline that explores novel statistical, algorithmic, and implementation challenges that emerge in processing, storing, and extracting knowledge from Big Data.

Course Objectives:
1. To apply fundamental algorithmic ideas to process data.
2. Learn to apply hypotheses and data into actionable predictions.
3. To provide an understanding of R language.
4. To split the input data set into independent chunks that is processed in a completely parallel manner.
5. Document and transfer the results and effectively communicate the findings using visualization techniques.

UNIT I INTRODUCTION TO DATA SCIENCE
Introduction to Data Science - Introduction to Data science technologies Overview of the Data Science process – roles, stages in data science project – working with data from files – working with relational databases – exploring data – managing data – cleaning and sampling for modeling and validation – introduction to NoSQL. **(9)**

UNIT II MODELING METHODS
Choosing and evaluating models – mapping problems to machine learning, evaluating clustering models, validating models – cluster analysis – K-means algorithm, Naïve Bayes – Memorization Methods – Linear and logistic regression – unsupervised methods. **(9)**

UNIT III INTRODUCTION TO R
Reading and getting data into R – ordered and unordered factors – arrays and matrices – lists and data frames – reading data from files – probability distributions – statistical models in R - manipulating objects – data distribution. **(9)**

UNIT IV MAP REDUCE
Introduction – distributed file system – algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce – Hadoop - Understanding the Map Reduce architecture - Writing Hadoop Map Reduce Programs - Loading data into HDFS - Executing the Map phase - Shuffling and sorting - Reducing phase execution. **(9)**

UNIT V DELIVERING RESULTS

Documentation and deployment – producing effective presentations – Introduction to graphical analysis – plot() function – displaying multivariate data – matrix plots – multiple plots in one window - exporting graph - using graphics parameters. **(9)**

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand the concepts of machine learning
2. Appreciate supervised and unsupervised learning and their applications
3. Manipulate data by applying fundamental algorithmic ideas.
4. Process large volumes of data in parallel by dividing the work into a set of independent tasks.
5. Gain a foundational understanding of business analytics.

Text Books:

1. Nina Zumel, John Mount,:"Practical Data Science with R", Manning Publications, 2014.
2. Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman: "Mining of Massive Datasets", Cambridge University Press, 2014.

References:

1. W. N. Venables, D. M. Smith and the R Core Team: "An Introduction to R", 2013.
2. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta: "Practical Data Science Cookbook", Packt Publishing Ltd., 2014.
3. Nathan Yau: "Visualize This: The FlowingData Guide to Design, Visualization, and Statistics", Wiley, 2011.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

.

Dept. of Computer Science & Technology

Minors in Computer Science & Technology

B. Tech III Year II Semester

18MDCST201 BIG DATA MANAGEMENT AND DATA ANALYTICS LABORATORY

L	T	P	C
0	0	4	2

Course Prerequisite: Nil

Course Description:
Modern scientific, engineering, and business applications are increasingly dependent on data, existing traditional data storage technologies were not designed for the complexity of the modern world. Data Analytics has emerged as a new, exciting, and fast-paced discipline that explores novel statistical, algorithmic, and implementation challenges that emerge in processing, storing, and extracting knowledge from Big Data.

Course Objectives:

1. To Optimize business decisions and create competitive advantage with Big Data Analytic.
2. Imparting the architectural concepts of Hadoop and introducing map reduce paradigm.
3. To introducing Java concepts required for developing map reduce programs
4. To derive business benefit from unstructured data
5. Introduce programming tools PIG & HIVE in Hadoop echo system.
6. Developing Big Data applications for streaming data using Apache Spark

LIST OF EXPERIMENT

1. Perform setting up and Installing Hadoop in its two operating modes:
   - Pseudo distributed
   - Fully distributed.

.

2. Use web based tools to monitor your Hadoop setup.

3 a) Implement the following file management tasks in Hadoop:
   - Adding files and directories
   - Retrieving files
   - Deleting files

b) Benchmark and stress test an Apache Hadoop cluster.

4. Stop word elimination problem:
   - Input:
     A large textual file containing one sentence per line
     A small file containing a set of stop words (One stop word per line)
   - Output:
     A textual file containing the same sentences of the large input file without the words appearing in the small file.

5. a) Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented. Data available at: https://github.com/tomwhite/hadoop-book/tree/master/input/ncdc/all.
   - Find average, max and min temperature for each year in NCDC data set?
   - Filter the readings of a set based on value of the measurement, Output the line of input files associated with a temperature value greater than 30.0 and store it in a separate file.

6. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

7. Write a Pig Latin scripts for finding TF-IDF value for book dataset (A corpus of eBooks available at: Project Gutenberg).

8. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

9. Install, Deploy & configure Apache Spark Cluster. Run apache spark applications using Scala.

10. Data analytics using Apache Spark on Amazon food dataset, find all the pairs of items frequently reviewed together. Write a single Spark application that:
    - Transposes the original Amazon food dataset, obtaining a PairRDD of the type:
    - <user_id> → <list of the product_ids reviewed by user_id>
    - Counts the frequencies of all the pairs of products reviewed together;
    - Writes on the output folder all the pairs of products that appear more than once and their frequencies. The pairs of products must be sorted by frequency.

Course Outcomes:

After completing this course the students should be able to

1. Preparing for data summarization, query, and analysis.
2. Applying data modelling techniques to large data sets
3. Creating applications for Big Data analytics
4. Building a complete business data analytic solution.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

.

Minors in Computer Science & Technology

B. Tech IV Year I Semester

18MDCST105 DATA MINING AND DATA WAREHOUSING

L	T	P	C
3	0	0	3

Course Prerequisite: 18CST105

Course Description:

In this course we explore how this interdisciplinary field brings together techniques from databases, statistics, machine learning, and information retrieval. We will discuss the main data mining methods currently used, including data warehousing and data cleaning, clustering, classification, association rules mining, and web mining.

Course Objectives:

1. To understand the fundamentals of Data mining and Pre-processing techniques
2. To understand the concept of Data warehouses.
3. To understand the algorithms of supervised techniques.
4. To understand the algorithms of unsupervised techniques.
5. To know the applications of data mining in the real world.

UNIT I INTRODUCTION TO DATA MINING

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation, role of Data warehousing in Data mining. **(9)**

UNIT II MINING FREQUENT PATTERNS

Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining **(9)**

UNIT III CLASSIFICATION AND PREDICTION

Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Backpropagation, Lazy Learners, Other Classification Methods, Prediction, Accuracy and Error measures, Evaluating the accuracy of a Classifier or a Predictor, Ensemble Methods. **(9)**

UNIT IV CLUSTER ANALYSIS

Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis. **(9)**

UNIT V APPLICATIONS IN DATA MINING

Social networks Analysis, Web mining, Text mining, Multimedia. **(9)**

Course Outcomes:-

1. Student is able to preprocess any real world dataset by using preprocessing techniques.
2. Able to distinguish the OLTP and OLAP.
3. Able to implement data mining techniques such as Associations, classification.
4. Able to implement clustering techniques and its applications.
5. Students can identify the applications where data mining techniques can be applied.

Text Book:

1. Tan, Pang-Ning& others. “Introduction to Data Mining” Pearson Education, 2006.
2. S. Sumathi& S.N. Sivanandam “Introduction to Data mining and its applications”, Springer-verlag

References:

1. Han J &Kamber M, “Data Mining: Concepts and Techniques”, Morgan Kaufmann Publishers,Second Edition, 2006
2. Dunhum M.H. & Sridhar S. “Data Mining-Introductory and Advanced Topics”, Pearson Education, 2006.
3. Grigoris Antoniou and Frank van Harmelen “A Semantic Web Primer”, The MIT Press Cambridge, Massachusetts London, England 2003.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.